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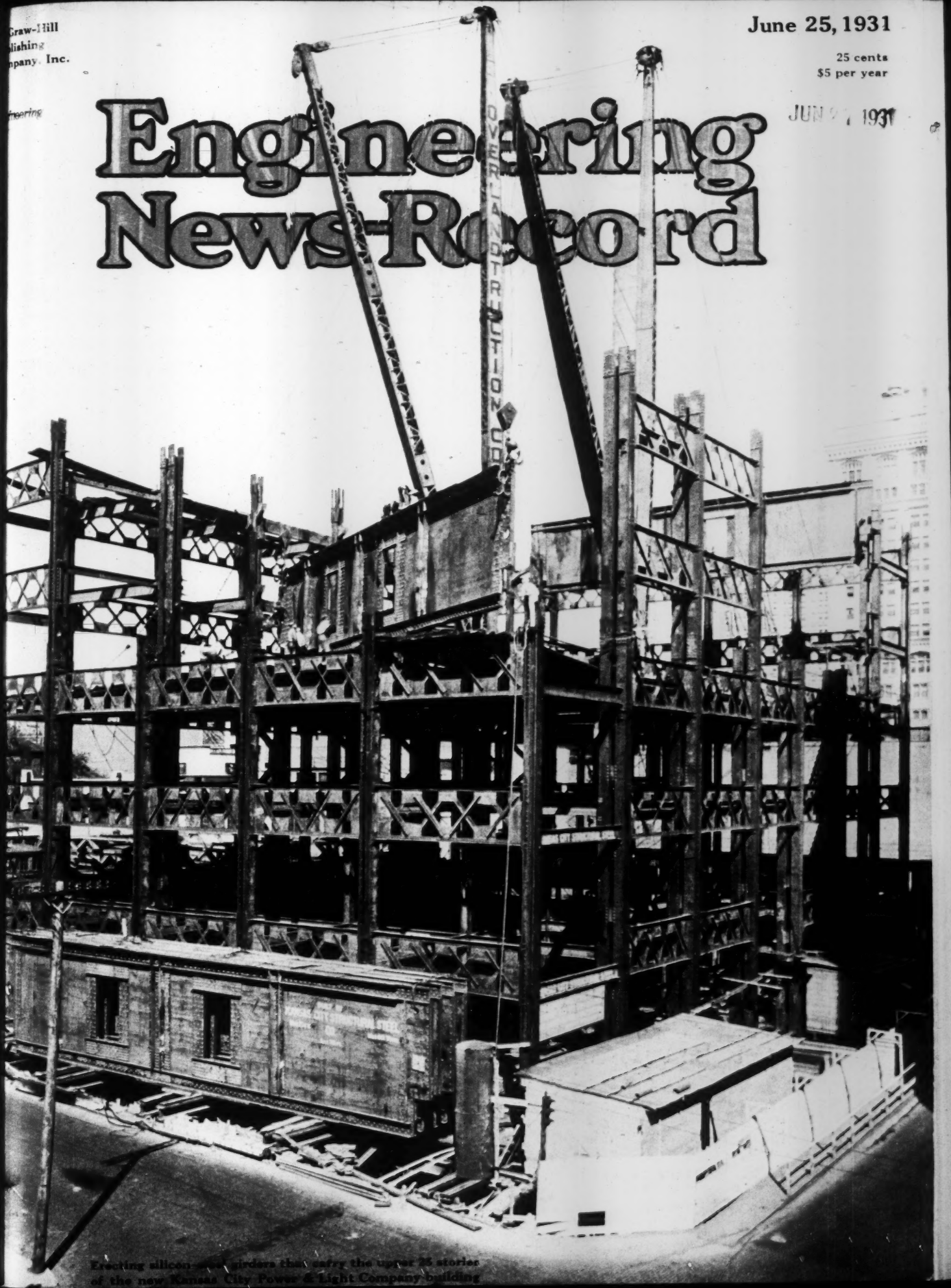
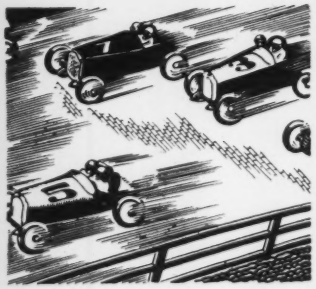


Erecting silicon-steel girders that carry the upper 25 stories of the new Kansas City Power & Light Company building

21 Years *Under the Grind of the Racetrack*

Indianapolis Speedway—resurfaced with Vitrified Brick in 1909.



THE first Annual International Automobile Sweepstake was run on the Indianapolis Speedway in 1909. Then, the phenomenal speed of 51.4 miles per hour was hung up by the winning Chalmers-Detroit. ♦♦ After this one race, it was found that the surface of the track had been so badly damaged by the "terrific" speed of the cars, that resurfacing was necessary. ♦♦ This time, brick was selected. Since that time twenty races have been run. The speed of the cars has doubled—and still that brick surface is there standing up under the grinding punishment of race after race. ♦♦ Its condition after all these years is indicated by the report of a committee of racing experts this year, who said: "Not a single brick in the Indianapolis Speedway needs to be changed." ♦♦ It is records such as this which prove brick to be the only time tested material for surfacing heavy duty pavements.

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A Consolidation of Engineering News, Engineering Record, The Sanitary Engineer, and the Contractor

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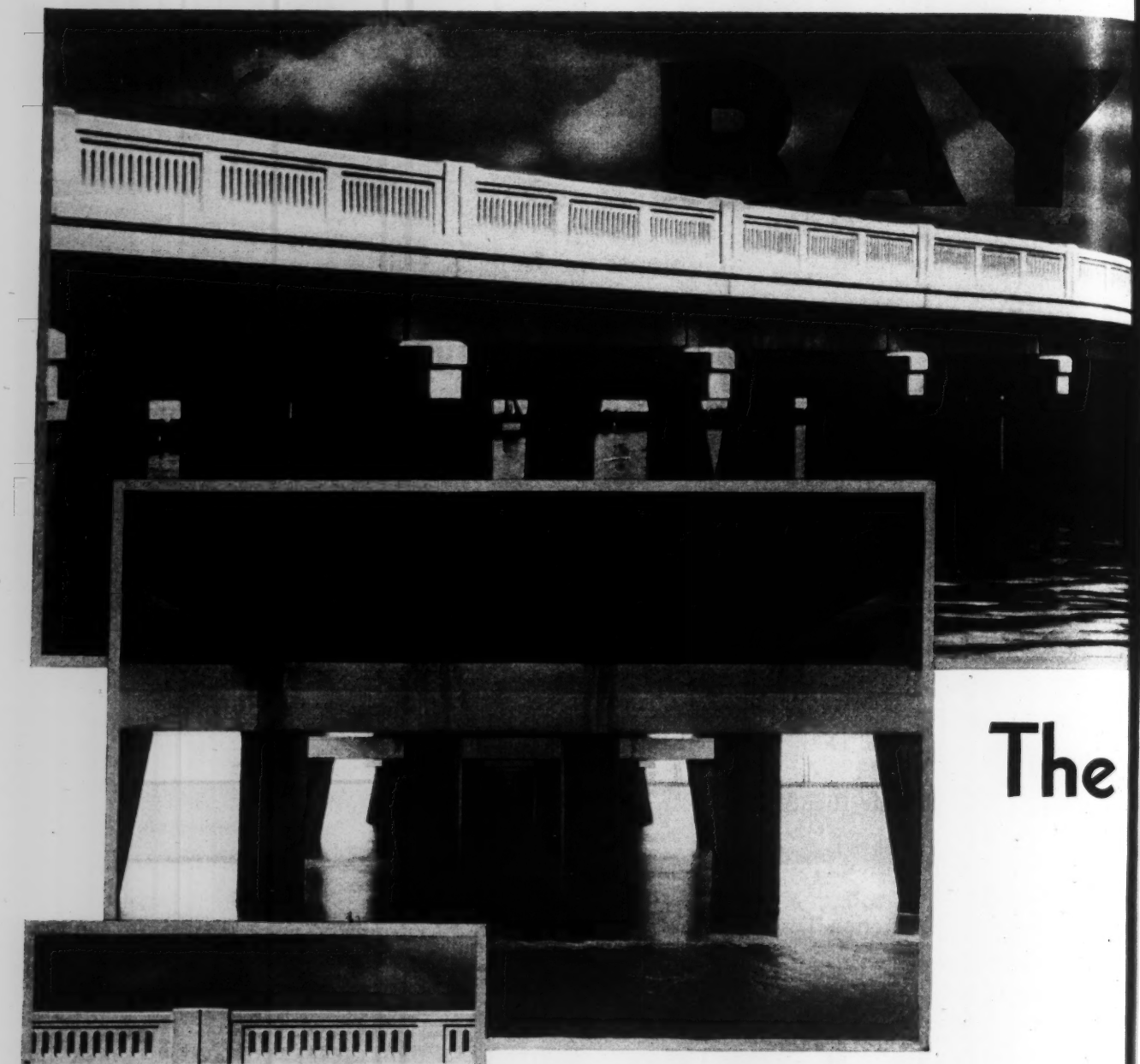

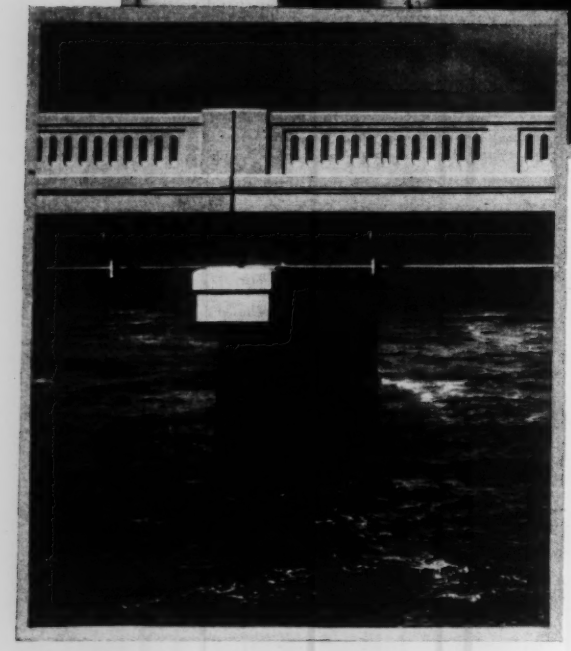

The

An Outstanding Example of Fine Workmanship in Special Concrete Construction

ENGINEERING NEWS-RECORD

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 106 — NEW YORK, JUNE 25, 1931 — Number 26

Contracts Are Next

THE bids received last week for the Golden Gate bridge should allay any fears that the structure cannot be paid for within the authorized $35,000,000 bond issue. The best combination of bids for the five main contracts was $21,651,608. The additional contracts for approach roads, toll terminals, paving and cement aggregate about $2,500,000. There are thus ample funds remaining to meet any unforeseen conditions that may arise. The initial doubt as to the adequacy of the original $31,000,000 estimate of the engineers arose from an inevitable comparison with the $26,000,000 Philadelphia-Camden bridge or with the $60,000,000 Hudson River bridge, both structures of shorter span. What was not taken into account was that the two Eastern bridges were burdened with prodigious real estate costs while all land for the Golden Gate bridge approaches was donated. It is also a fact that while the Golden Gate bridge is 700 ft. longer than the Hudson River bridge, it is designed for loads only about half as great; it utilizes two 36-in. cables, against four 36-in. cables at New York. The 20 per cent discrepancy between bids and engineers' estimates reflects clearly the decline in material prices and the keen competition that exists on all work at this time. It is to be hoped that the recent adverse report on the safety of the serpentine rock formation at the south pier will be speedily weighed against the favorable opinions, and the existing design modified if necessary so that no delay will occur in starting the work. San Francisco needs the bridge and the industry needs the work. Contracts are next.

Curtailed Expenditure

ONE ITEM of direct interest to civil engineers and to the construction industry in the plea of the railroads for increased rates is the great curtailment of expenditures for new construction and for maintenance-of-way that the railroads have had to make in recent months because of their greatly reduced income. In 1930, in response to the President's urgent request that as much new work as possible be undertaken, the railroads embarked upon a program of new construction of a magnitude similar to their program of the more prosperous years of 1928 and 1929. Nearly $600,000,000 was spent in that program. But the year 1931 brought greatly reduced income and higher rates for new capital. The vast new construction program had to be curtailed. Likewise expenditures for maintenance-of-way had to be greatly reduced. Expenditures for maintenance-of-way and structures during the first four months of 1931 amounted to $181,300,000, compared with $235,600,000 in 1930. These figures show how closely railroad credit is related to a considerable part of the work upon which the construction industry depends for its prosperity. Emergency expenditures in excess of what sound business judgment dictates, such as the railroads made in 1930, cannot be continued indefinitely.

Is Public Work Extravagant?

A FEW days ago M. K. Hart, president of the New York State Economic Council, made the charge that public work is wasteful. He said that it costs too much, partly because of clumsy and archaic methods of letting contracts. This is a serious charge, not the less so because it was only part of a general indictment of public-works planning as haphazard and extravagant. It is presented for answer by engineers who direct public works. From our own knowledge we could cite cases that contradict Mr. Hart—cases of public-works construction which in cost and speed show a definite advantage over comparable private work. The best examples of public toll-bridge construction yield nothing to similar private enterprise. Water planning and construction is an even more general case of proof. But Mr. Hart's charge is worthy of a broader answer. What is the verdict of municipal and state engineers? What proof can they assemble to counter the charge? The question is decisively important, and we shall be glad to publish replies.

Longer Concrete Rigid-Frame Bridges

NOTABLE advance in concrete rigid-frame bridge design is made with the completion of the Martinez Street bridge in San Antonio, Texas. Following in general principle the numerous rigid-frame structures that have been built in Westchester County, N. Y., the San Antonio bridge has a span length 25 per cent longer than any of the Westchester bridges and at the same time maintains the usual crown thickness ratio of about one thirty-fifth of the span. It is of ribbed design, while Westchester County favors barrel-type construction, although ribbed frames have been used. The San Antonio bridge departs from precedent in one important detail—namely, in the use of a thick soffit slab near the abutments which is integrated with the ribs to provide T-beam action to resist the negative bending moment. The relatively long span is the more notable because Westchester County experience had indicated an economic span limit of about 80 ft. for concrete bridges and had in fact dictated the use of structural steel for spans greater than this. Recent studies by Arthur G. Hayden, of the Westchester County Park Commission, however, demand a revision upward for the economic span limit of concrete rigid-frame bridges. He reports carefully made designs and estimates for a three-span rigid-frame bridge with clear openings of 130 ft. each that showed practically the same cost for either barrel-type

concrete or steel construction. That much longer concrete spans are possible is a certainty, for there has recently been completed a three-span continuous frame in Brazil with a center span 224 ft. long and a crown thickness of one-fortieth of the span. Such slender structures are bold in the extreme and would have to be analyzed carefully in the light of current highway loadings in this country. But the proved possibilities of continuous construction in the way of increased efficiency and esthetic value warrant its serious consideration for the many bridges of the future.

Staggered Closing

STAGGERED closing hours as between offices and retail establishments are under trial in San Francisco as a means of relieving the evening traffic peak. By voluntary agreement, large office organizations involving 10,000 employees will begin work half an hour earlier and close at 4:30. From this beginning it is expected that the number to adopt the plan will gradually double. Because the program is voluntary and based on a complete study of conditions, this program differs from the compulsory plan applied in Washington during the War and the unsuccessful trial in New York which, through insufficient study, created worse peaks than those eliminated. The general theory has much to commend it. Traffic peaks in downtown metropolitan areas are serious problems, that grow steadily worse. Although the present peak of 63,000 at San Francisco is not critical when compared with the Chicago or New York evening crush, it is large enough, and the means of transportation are varied enough to provide a valuable experiment. Those concerned with traffic problems and city planning questions should be interested in following this development.

District Bonds Upheld

REVERSAL by the Ohio Supreme Court of its previous decision in the Allen County bond case has relieved public works officials in that state from an embarrassing situation. The original decision, handed down last February, was a bombshell destroying a fiscal system which had been functioning successfully for years. It has long been the custom in Ohio to finance sanitary and some few other types of public improvements by the creation of special districts empowered to issue bonds guaranteed by a county or municipality, the intent being to retire the bonds through special assessments levied upon the property benefited. But when, in the case cited, a default occurred, and a bondholder attempted by legal action to obtain redress from the county as guarantor, the court ruled that the obligation was invalid on the ground that a county cannot use its general revenues for the benefit of only a part of its population. Plausible as this argument may appear, its logical result would be the retirement of counties and municipalities from almost all public improvement work, for how many roads, bridges, sewers or other engineering works are a direct benefit to every taxpayer in the political division that builds such an improvement? Fortunately the court, upon reconsideration, reversed itself, thus changing a critical situation into a victory for the district system of financing. Undoubtedly the effect of this litigation will be to improve the status of such bonds. Also, it should have the effect of subjecting proposed special district undertakings to more intensive economic scrutiny than some have received in the past.

A New Code of Ethics Needed

ETHICAL rules of thirty of forty years ago still govern engineering practice. They are sadly inadequate to meet the demand of modern practice. Strenuous competition renders them obstructive rather than helpful, and as a result the old rules are honored in the breach more often than in the observance. Only a new code of ethics can bring consulting practice into harmony with the facts of modern engineering requirements.

What this means is not that the principles of honesty and fair dealing are to be rewritten, or the dictates of courteous and considerate relations between men disregarded. Such fundamentals are unchanged. A code of ethics is not a statement of basic principles, but a set of rules for applying the fundamentals in such manner as to keep sound the relation of engineers to one another and to the public. Hence changes in prevailing methods of engineering practice or changes in our community life tend to make old rules obsolete and call for revision. Developments of this kind within the last two or three decades are the moving reasons for a new code of ethics.

We have ceased to be a nation of small communities in which the mayor or the members of council know all the merchants and professional men by name and reputation, and in which the limits of the local community bound the activities of most of the inhabitants. The nation has become, in effect, one great community without geographical boundaries to the professional activities of a great many of its engineers. Correspondingly there is less general knowledge of the specialties, experience and qualifications of the individual engineers. Complex problems also have come with modern developments, and clients, be they individuals or communities through their elected representatives, no longer can step around the corner to John Smith's office and ask him to undertake a task for them with full confidence that John Smith is the right man for the job. Present codes of professional ethics were not framed with these conditions in view.

It is the essential spirit of the old code that the client shall seek the engineer, the latter quietly waiting in his chambers. But clients do not thus seek engineers, at least in sufficient numbers. In consequence most engineers cannot sit quietly at their office desks waiting for business, but must go out to meet it at least half way. Engineers may not compete; but they do compete, and must do so in order to secure engagements. Engineers may not say anything that would injure the prospects of another engineer; but in competition they often find their only argument to be either self-laudation or deprecation of another engineer as lacking sufficient special experience—both condemned by the code.

That engineers must advertise, that they must compete—openly and above board rather than by the indirect methods now adopted in vain attempts to keep within the code requirements—is inevitable. The problem then is to rewrite the code of ethics in such a way that these and other present-day requirements will be recognized and proper limits set upon them. The profession must determine what kind of competition is fair and advantageous both to the engineer and to his client; it must determine and set up limits beyond which advertising must not go. Fees and compensation may also need to come up for consideration.

In all the revision the primary fact should not be overlooked that all rules must be controlled by the necessities and conveniences of those with whom the engineer does business. The need for a readjustment

of the relation of one engineer to another to meet modern conditions is only one force back of the demand for a new code of ethics. More efficient engineering service to the public is the essential criterion of the new code

Special-Privilege Legislation

STEEL fabricators, together with plumbers and steamfitters, heating and electrical contractors and some other contracting trades, have had their freedom from the general contractor written into law in New Jersey. From now on they will deal directly with the contracting officials wherever state buildings exceed $50,000 in cost. They expect thus to avoid the troubles previously had in determining the credit of their customers and collecting their pay. In the background also is the pleasant hope that they will no longer be troubled by persistent shopping for bids.

Obviously individual contracts for definitely separable tasks have a proper place in construction practice—a place as well defined as that of the general contract. In bridge construction separate contracts for foundations and for steelwork are common. It is almost inconceivable, for example, that the great suspension bridge across the Hudson River now under construction by the Port of New York Authority should be contracted in any other way. Where the organization exists, as in the case of the Port Authority, to coordinate and synchronize operations, separate contracts are logical and advantageous. It is easy to carry the exemplification to many other operations if necessary, but the facts will be generally admitted. On the other hand, without an existing coordinating organization, a general contract, such as that for Boulder Dam, is logical and probably most efficient. The demarcation of policy lies in the administrative equipment of the contracting agent to manage construction and not in any inherent superiority of general contracts or segregated contracts.

But the economic justification of separate contracts does not extend to contracts where the separate operations are small, nor does it warrant compulsion of the owner by legislation to surrender his freedom of contract. New Jersey public building construction is not —nor indeed is all public building—a large enough part of the total of construction to affect greatly the business of either the general contractor or the contracting trades. Confessedly, the contracting trades invoke separate-contract legislation like that of New Jersey not in order to get more business but to secure better creditors—easier bill collecting and less shopping for prices. The consideration is purely avoidance of credit hazards. The contracting trades get the business anyway; the new law merely gives them a different customer. Obviously the sureness of pay by the state, and possibly the ease of collection, are greater; but that this new customer will be less exigent in price dealing is far from certain.

It is fact that general contracting has often been unfair in dealing with the subcontracting trades, and that in this evil lies the force of the latter's claim for independent contracts. The veniality, however, is more true of general contractors than of general contracting; it is individuals of the business and not the business that have failed in rectitude. Large contracting businesses are not free of these individuals nor are small contracting businesses composed of them entirely. The contrary belief is an error that too often creeps into discussions of contracting business integrity. The financial tricksters and incompetents of contracting are the irresponsibles of both classes, and they are plentiful in contracting as in other lines of business and are being as vigorously combated in contracting as in any business. This holds true for the subcontracting trades as well as for general contracting. Subcontracting has its irresponsibles.

Legislating separate contracts offers no solution to irresponsibility in contracting. Instead, it stresses present jealousies of general and subcontracting; it denies the public freedom of contract; it further injects political activity into the detail of public works; it extends the organizations necessary to supervise public construction; and it curtails the business opportunities of general contractors. By such legislation the subcontractor is insured better credit practice on the part of his customer, but the customer is not insured better subcontracting service, and he loses the services of the general contractor as guarantor of cost and quality of work and of relief from accidents, defaults and damage. These responsibilities, as well as that of management, are taken over by the customer under the split-contract system. In short, the system serves the subcontractor but does not serve the public. It is special-privilege legislation, not public-interest legislation.

Blessings in Disguise

FROM a structural engineering viewpoint the new Kansas City Power & Light Co. building represents one of the most commanding designs executed in this country in many years. The features—principally long-span pin-connected silicon-steel girders that carry 25 stories of the building and the concentration of wind resistance in the wall bents—are described by the designer elsewhere in this issue. Here we are concerned with one of the structure's broader aspects—namely, its effect on the art. Complicated designs and arresting achievements are so rare in the building field that they should be welcomed with enthusiasm. This is not to say that simplicity is not a virtue. Often, perhaps usually, the simpler design is the more efficient. But now and then certain architectural requirements are laid down that cannot be met by bare simplicity and particularly by simplicity of the canned variety that results from lifting a few principles and figures from a handbook and scrambling them together. The complications of such a design provide the structural engineer with an opportunity to display his mettle and to give wide and adequate play to his ideas and ingenuity. It singles him out and raises him above the sort of individual who produces "bargain-counter" designs to the delight of some architects.

In a great many instances vituperation is rained on the heads of architects and owners for requiring layouts that complicate the engineer's design task. Yet viewed in the larger sense these complicated jobs are blessings in disguise. On the Kansas City building the requirement for an open auditorium on the fourth floor of a 30-story skyscraper was in many respects capricious. Yet as a result the designer produced a design that has probably given him more pleasure and the profession more prestige than a half-dozen ordinary buildings, however tall. Complicated jobs may seem disagreeable in contemplation, but their successful evolution preserves faith in that branch of structural engineering that has elected to serve the building field.

Long Pin-Connected Girders Carry 25 Floors of Steel

Auditorium between fourth and sixth floors of 30-story skyscraper in Kansas City spanned by six pairs of silicon steel girders supported by silicon steel columns—Wall bents developed for wind resistance

By C. A. GLASS
Consulting Engineer, Kansas City, Mo.

THE STRUCTURAL DESIGN of the new Kansas City Power & Light Co. building, in Kansas City, Mo., involved a number of novel features resulting for the most part from the requirement for an auditorium to occupy practically the entire area of the fourth and fifth floors. This auditorium is spanned by a series of silicon steel plate girders arranged in pairs and pin-connected to silicon steel supporting columns. Each girder carries three columns that extend from the seventh floor to the roof. In effect, therefore, a 25-story skyscraper is carried on the girders, which have a span of 70 ft., are 14 ft. deep and weigh about 60 tons each. Of the 6,300 tons of steel in the building 1,472 tons are silicon steel. The use of this alloy steel permitted a saving of 7½ per cent of the cost of an equivalent in carbon steel and effected a further indirect saving by permitting more compact members.

As a result of the open auditorium, only one line of columns, exclusive of those in the walls, is continuous from foundation to roof. Wind resistance, therefore, is practically all centered in the wall bents, which utilize deep trusses and plate girders as spandrels. Other structural features of the building include fulcrum-supported foundation girders, grouted grillages, shallow girders supporting offset columns at the sixteenth floor and wind connections flame-cut from special 37.5-in. rolled sections.

The building is 131x100 ft. in plan and is 479 ft. high, including a 70-ft. lantern rising from the roof of the 30th floor. The major portion of the building will be occupied by the owner. The first three floors are devoted to business offices and retail sales departments, the fourth and fifth to the auditorium, part of the sixth floor over the south end of the auditorium to a gymnasium two stories high, and the seventh floor to the gymnasium balcony, locker and shower rooms and a clinic for the employees. Handball courts and a cafeteria are housed on the eighth floor. The rest of the floors up to the 20th are occupied by company offices, leaving the 20th to 29th floors available for rental and for company expansion.

Foundations—The building is carried on concrete piers founded on a limestone ledge 9 to 10 ft. thick and overlying alternating strata of shale and limestone. The limited height from the top of the limestone ledge to the sub-basement floor required rather shallow cantilever girders to support the columns along the west wall. The girders under columns 15 to 18 are 54 in. deep, arranged in pairs, each single girder made up of five web plates and four flange angles. Since any deflection of these girders would bring an excessive pressure on the outer part of the foundation, the girders were designed as true cantilevers with a fulcrum billet on top of the bearing slab.

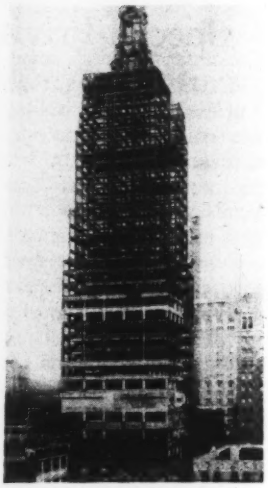


Fig. 1—Kansas City's tallest building
The new building of the K.C. Power & Light Co.

Another feature of the grillages was the use of high-strength (2:1) grout to distribute the bearing pressure from the slab to the grillage beams. This design resulted from the observation that unsatisfactory contact conditions often obtain when the lower face of a slab is planed for direct bearing on the top flanges of grillage beams. In this case a preliminary calculation showed that a pressure of 1,000 lb. per sq.in. for the area of the slab would load the grillage beams to the limit of their safe strength. For placing the grout, all slabs were provided with a hole in the center, tapped for a 2-in. pipe. It had been planned to inject the grout under pressure, but it was actually placed with a cement gun. The cost of the grouting operation was offset by a saving in steel, since the elimination of planing on the slab permitted about ¼-in. reduction in the thickness of the slab. The cost of planing was also saved, and the grillage beams required no special selection or conditioning.

Extensive Use of Silicon Steel

The two-story auditorium with floor at the fourth-story level and ceiling in the sixth story is the outstanding feature of the building, since practically all of the special structural design is attributable to its presence. The room, including stage is 63 ft. 8 in. by 123 ft. 3 in. in plan and is entirely free of columns. The main floor has a pitch of 3 ft. The ceiling, being the sixth floor of a 30-story building, presented some interesting design problems. Riveted trusses two stories deep were designed and discarded as being subjected to too large secondary stresses. Three-story trusses would have been satisfactory from the stress standpoint but would have seriously affected the seventh-floor layout. Two-story pin-connected trusses were designed as an alternate, but the eyebar heads were found to interfere with other construction. Finally, the structural steel contractor agreed to carry out the design in pin-connected plate girders of slightly more than one-story depth, the beamed ceiling of the auditorium permitting 45 in. of web to extend below the sixth-floor line. Six pairs of these plate girders (Fig. 2) are used, each pair carrying three columns. The maximum load on any

of these supported columns is 1,170 tons. The maximum end shear on one pair of girders is 2,170 tons, and the maximum bending moment is 70,265,000 ft.-lb.

Girders—Four pairs of girders (between the sixth and seventh floors) were designed of silicon steel, using a 24,000-lb. unit stress. The other two pairs of girders (between the eighth and ninth floors) are not so heavily loaded and were designed of carbon steel, using an

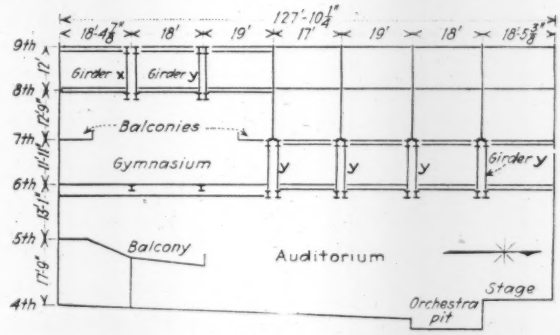


Fig. 2—Section through building, showing silicon steel girders over auditorium and gymnasium

18,000-lb. unit stress. The girders are 14 ft. 7 in. back to back of flange angles and are 72 ft. 2¼ in. long over all. Each of the silicon steel girders has a web plate 174x$\frac{7}{8}$ in. and a top flange of four 8x8x$\frac{7}{8}$-in. angles, two 13x$1\frac{3}{16}$-in. plates and three 21x$\frac{3}{4}$-in. cover plates; the bottom flange has the same area but is narrower, to conform with architectural requirements in the ceiling of the auditorium, and is made up of four 8x6x1-in. angles, two 13x1-in. plates, one 14x$1\frac{3}{16}$-in. cover plate and two 14x$1\frac{1}{8}$-in. cover plates.

All holes in the girders were drilled. All rivets are $1\frac{1}{8}$ in. except those for the diaphragms, which are $\frac{7}{8}$ in. Stiffeners are provided under the columns and around the doorway openings, two of which, 4 ft. 2 in. by 7 ft. 8 in., are cut in all except one pair of girders. To guard against corrosion and to provide stiffness, the space between the girders is filled with concrete. Pipe separators with $1\frac{1}{8}$-in. tiebolts are provided on 2 ft. vertical by 4 ft. horizontal spacing to insure against bulging during concreting. The use of these tiebolts and separators with the concrete filling eliminated the necessity for intermediate stiffener angles. The main stiffener angles under the columns are tied together with batten plates; the contractor elected to rivet these, as there was ample room between each pair of girders for men to work comfortably.

Pin bearings were chosen, the pins being carried in the top of the supporting columns and located on the neutral axis of the double girders. This position of pin bearings on the girders was chosen to avoid any change of length center to center of bearings under loads. Expansion joints, the full depth of all girders at both ends, permit any contraction or expansion to take place freely, without distorting the girders or columns and cracking the two concrete floors carried on the girders. The space between the girders at the two ends outside the diaphragms was not filled with concrete, thus providing a certain flexibility that leaves the girders free to deflect without distorting the supporting columns. Fiber board was used for filling the expansion spaces. This filling excluded the concrete from the expansion joints, and at the same time was capable of being compressed when the portion of the expansion joints beneath the neutral axis closed as the dead load on the girders was increased. The floor finish for the sixth and seventh floors was not placed until the building was practically complete and all dead load was on the girders. It was not felt that the live loads would produce sufficient additional deflection to disturb the expansion joints to cause cracking of the floor finish.

Columns—The girders are carried on columns separate from the building columns. Provision for bracing these supporting columns in both directions was necessary. At the west end of the girders the building columns, which were about $6\frac{1}{2}$ ft. off the center line of the supporting columns, were tied to the latter with X-bracing of 10-in. 54-lb. beams, thus anchoring one end of each pair of girders to a rigid bent. To provide the necessary space for elevators, a stairway and a utility shaft, the bracing system surrounding these columns was completed with channels shown marked *C* and *E* in Figs. 3 and 5. The columns supporting the east ends of the girders were only 2 ft. off the center line of the east-wall

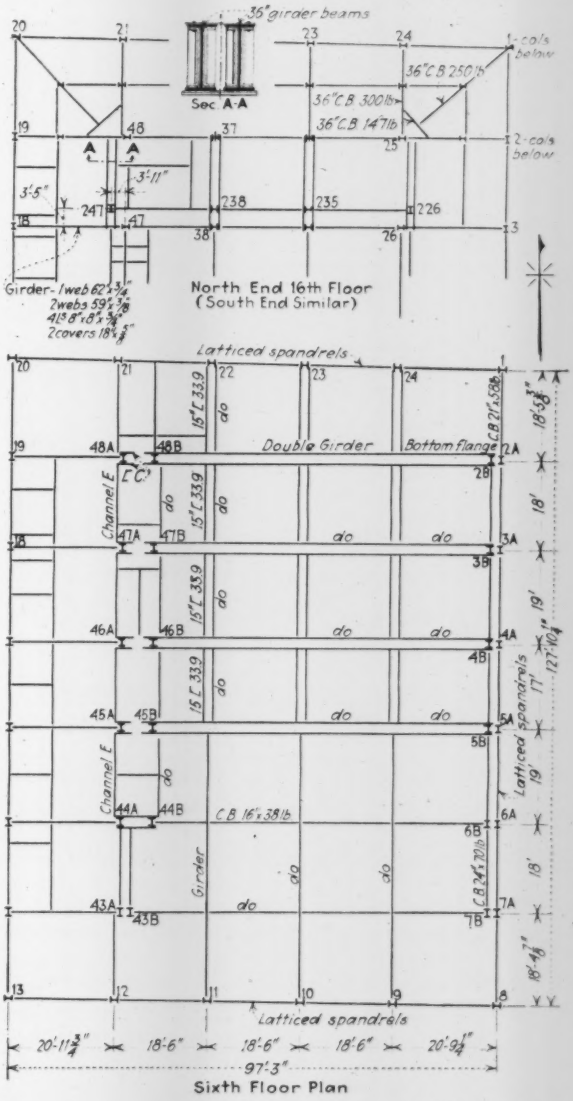


Fig. 3—Floor plans, Kansas City Power & Light building

Special silicon steel columns (marked *B*) carry girders over auditorium between fourth and sixth floors. Wall columns at sixteenth-floor setback carried on shallow built-up girders.

columns and were tied to these wall columns by plates spaced about 6 ft. apart vertically.

The columns supporting the west and more heavily loaded end of the girders are of silicon steel made up of an H-section core, four 5x3½x⅝-in. angles and flange plates 28 in. wide. The heaviest column utilizes a 425-lb. H and a 1⅝-in. thickness of flange plates. It has an area of 239.2 sq.in. and weighs 20 tons.

The erection of these girders and columns was accomplished without difficulty. The X-bracing between the *A* and *B* columns at the west end of the girders was not riveted until after the girders were erected, thus permitting a slight adjustment of column centers to match girder length. The open holes for this bracing were subpunched in the shop and field-reamed. Delivered on a 50-ton truck trailer, the girders were unloaded, hoisted and set on the pins by two 40-ton guy derricks. Special pin nuts, turned from a 1½-in. plate, were fastened to the

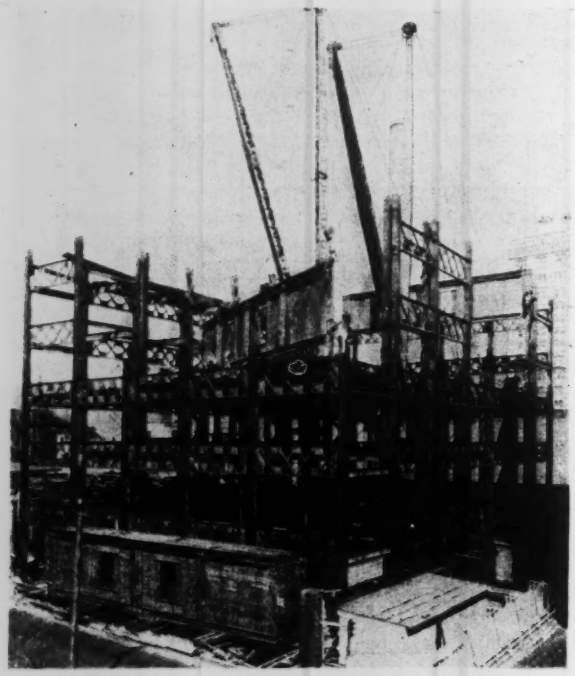


Fig. 4—Windbracing concentrated in wall bents

Spandrel trusses up to 6 ft. 9 in. depth used. Below about 4 ft. depth plate webs were substituted for the laced angles. View shows silicon steel girder being erected over fourth-floor auditorium.

ends of the pins with countersunk bolts. All pins were bored longitudinally with a 2½-in. hole and counterbored 4½ in. in diameter by ¼ in. deep for the pilot nut, which was held in place by a 2⅜-in. bolt passed through the pin. No difficulty was experienced in drawing the girders onto the pins, although the maximum clearance pin to pin hole was only 1/32 in. on the diameter.

Some difficulties were encountered in the fabrication of the silicon steel, hard spots found scattered throughout the plates and practically all of the shapes slowing up the drilling. Boring the pin holes proved to be the most difficult operation, since a surface of extreme hardness was presented that had resulted from the pilot hole having been burned out with a torch.

Wind Design

The large auditorium also complicated the design of the windbracing system. Only the exterior columns are continuous from the foundations to the sixteenth floor where the first setback occurs, and the one interior row of columns could not be tied together with beams on the center line of the columns. Considerable height was available between the windows of adjacent stories, so that the entire windbracing system was first designed to be located in the four exterior walls. However, it was found that about 30 per cent of the east-west wind load could be carried on the interior framing past the two-story auditorium, and the design was modified to take advantage of this, with some saving in the cost of exterior windbracing in the north and south walls. All of the north-south wind load is carried down in the east and west walls. The east-west wind loads originating in the upper part of the building are carried down in the north and south walls to the main setback at the sixteenth floor and partly below to the fifteenth, fourteenth and thirteenth floors and distributed horizontally through these floors to the north and south walls on columns lines 8 to 13 and 1 to 20.

The full height between windows is used for the spandrel girders, open webs of laced angles being used where this construction represented a saving as compared with plate webs, which generally were used where the depth available was 3 ft. 9 in. or less. The maximum depth of spandrel girder is 6 ft. 9 in. All spandrels are completely incased in concrete and faced with limestone.

Connections—It was decided during the early part of the design that if possible not more than two rows of rivets would be used in beam-to-column connections. Shortly thereafter it was found that the maximum connection required eight 1⅛-in. rivets to the column and eighteen ⅞-in. rivets to the beam or spandrel flange. Since fabricators generally require spacing in multiples of 3 in., a 6-in. gage would be required for the 1⅛-in. rivets connecting to the column and, in the space available, would require a split beam with a 1-in. web and a 1 9/16-

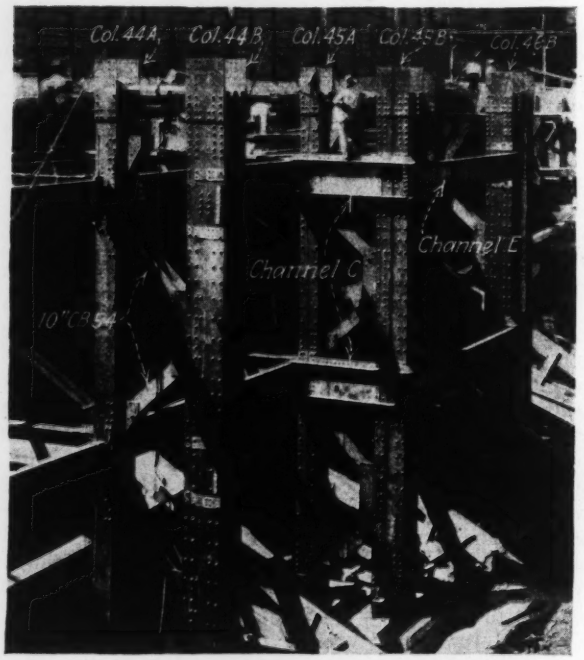


Fig. 5—Girder-carrying columns (at right) are rigidly tied to building columns for their full height of six stories

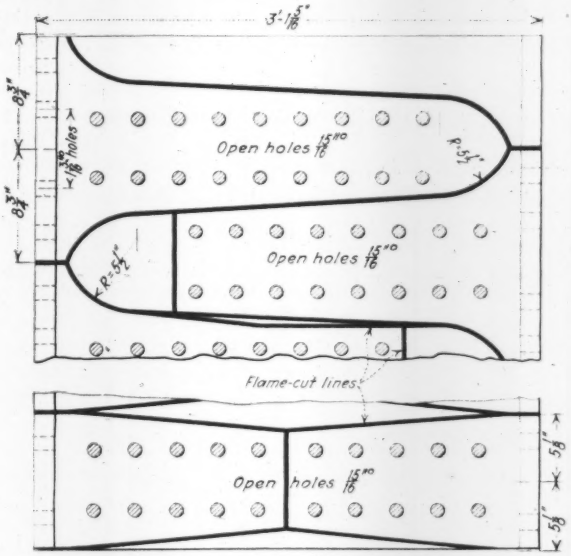


Fig. 6—Method of flame-cutting wind lugs from a specially rolled 37¼-in. girder section

in. flange. A flange width of 10 in. or less would be satisfactory from an architectural standpoint. An examination of the rolled sections available disclosed that Carnegie beams could be secured weighing 275 lb. per foot and having a 1 9/16-in. flange but only a ⅞-in. web, thus requiring an excessive width to maintain the needed net section. The 300-lb. section had practically the required web thickness but an excessively thick flange (nearly 1¾ in.). Both flanges exceed 16 in. in width. The web and flange dimensions of Bethlehem sections were found to be practically the same.

The problem was solved when the Carnegie Steel Co. consented to roll a special beam section in lots of 100 tons or more, having a depth of 37.3 in., a flange width of 12.4 in., a web thickness of 1 in., a flange thickness of 1.58 in. and a weight of 252 lb. per foot. About 115 tons of this special section was used in the building. Connection details were cut from these sections with practically no waste, as shown in Fig. 6. These heavy split-beam sections were used to provide for continuity of the windbracing system through the offsets and for general rigidity at connections to the larger girders and sixteenth-floor offset girders.

Wind-Design Procedure—A modification of the Morris-Ross method of wind design was used. First, the columns were designed for dead and live loads. Second, the moments of inertia of all the columns acting in one bracing system in one story were added together and the moment of inertia of each column divided by the sum, giving a decimal result. This was multiplied by the total wind shear on the system in this story to secure the wind shear on each column. The wind shear on the column being known, the stresses in the column and connecting beams were calculated and the connection details selected. This method was rather laborious for this building, as the wind stresses, being concentrated on only four lines of columns, were so large that a number of the columns had to be increased in size over dead and live-load requirements. This necessitated a second or third, and in a few cases, a fourth series of calculations.

Adjustment in the relative rigidity of certain columns, as compared with the others acting in the same system, was effected by using silicon steel. For example, in the south wall system columns 8 and 13 have one spandrel connection, while the other columns each have two. If all six columns were made of the same quality of steel, columns 8 and 13, if designed for dead and live load only, would be nearly as rigid as each of the others. The space available for spandrels and flange connections required almost an exact balance of two to one, as between the rigidity of columns 9 to 12 and 8 or 13. To maintain this balance of approximately two to one in their relative rigidities, columns 9 to 12 could be made considerably heavier. By using silicon steel for columns 8 and 13 these were made much lighter and consequently less rigid, thus maintaining the ratio of relative rigidities approximately two to one, without using appreciably more steel for the six columns than was required for dead and live loads alone.

Wind Transfer at Offsets—The offset columns at the sixteenth floor are carried on special shallow girders. A portion of this floor is shown in Fig. 3. The girder supporting column 247, which carries a load of 750 tons, is particularly notable. It is a double girder made up of two 36-in. 300-lb. rolled sections, four web plates 31½x⅝ in., eight flange angles 6x4x11/16 in. and eight flange plates 5x½ in. This rather special combi-

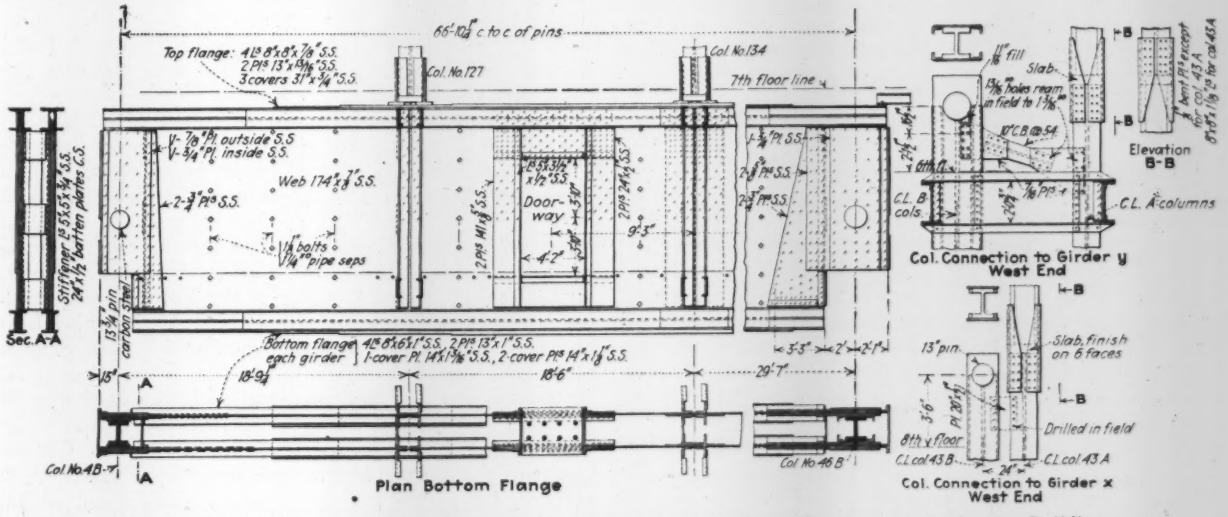


Fig. 7—Details of silicon steel girders and column connections, Kansas City Power & Light Co. Building

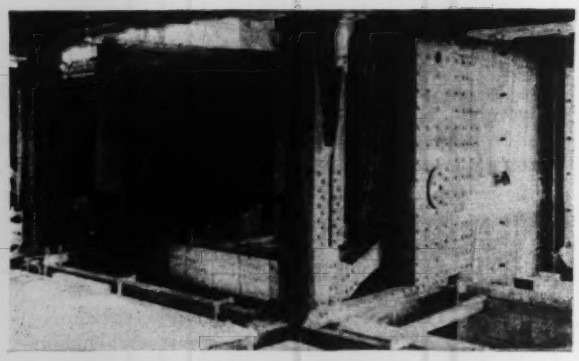


Fig. 8—Pin-connected girders at sixth floor
Note special splice in building column made necessary by turning upper column section 90 deg.

nation was necessary to provide for the moment and shear stresses and to permit sufficient stiffeners to be fitted. The 750-ton column load is carried by sixteen stiffener angles 7x3½x¾ in., while the end shear at the more heavily loaded end of the girder is carried by eight stiffener angles 8x5x1 in. This double girder is in turn carried on a single girder, as shown in Fig. 3, the heavier end bearing directly on the end of column 47, with four stiffener angles 8x6x1 in. The other double girders in this floor are similar in construction. At another point, where a 2-ft. column offset is required to transfer 630 tons, space permitted only a single girder 16 in. wide and 37 in. deep before fireproofing. The solution was a girder made up of one 36-in. 300-lb. rolled section, two web plates 31½x½, two web plates 29x½, four flange angles 8x6x¾ and four flange plates 5x½ in.

All offset girders are tied together with light girders of one plate and four angles (such as girder 238-247, (Fig. 3), with web connections and split-beam connections to the flanges of the offset girders at all points of concentrated loading. These light girders in combination with the split-beam connections from column to main offset girders complete the windbracing systems and materially reduce the torsion stresses in transferring the wind loads from the system above the sixteenth floor to the system below this floor.

Personnel—The firm of Hoit, Price & Barnes, Kansas City, Mo., was the architect. The structural design was made by the writer. The general contractor was the Swenson Construction Co., Kansas City, Mo. The Long Construction Co., Kansas City, Mo., was the contractor for excavation and foundations. The Kansas City Structural Steel Co. fabricated and erected the steel.

Village Flood Protection

East Peoria protects itself against destructive floods of Farm Creek by channel works at cost of $1,200,000

By JACOB A. HARMAN
Consulting Engineer, Peoria, Ill.

THAT flood-protection measures may be economically practicable for small communities, as well as for large cities and for vast and spectacular projects like those of the Mississippi River and its tributaries, is well illustrated by the works protecting East Peoria, a village of 5,000. A small tributary of the Illinois River has flooded the district to depths of 3 to 10 ft. In one year alone the damage was estimated at nearly $2,000,000. The following article shows how the new works, providing permanent relief, will cost considerably less than this. Of equal importance, though less tangible, is the human value, made up of the elimination of deaths, injuries, sickness, misery, loss of wages and destruction of homes and personal property due to floods. —EDITOR.

FLOOD-CONTROL MEASURES for the smaller class of communities are exemplified in the works now nearing completion at East Peoria, Ill., an industrial and residential village of 5,000 population, separated from the city of Peoria by the Illinois River. These works include the relocation and enlargement of the Farm Creek channel and its levees, the construction of a new relief channel and spillway, extension of railroad and highway bridges and relocation of railroad tracks, highways and wire lines.

Three highway bridges and three railroad bridges cross the channel (Fig. 2) within the village, and the railroads occupy levees on both banks for the greater part of the distance. The length of the present improvement is about 3 miles, the upper two-thirds of which is principally residential area, while the lower part is a partly leveed and partly filled industrial area. The Farm Creek drainage area contains 70 square miles of rolling farm and wooded lands, with hills rising about 250 ft. on either side of the valley, ½ mile wide. The channel winds through this valley, which is an alluvial deposit containing much sand and gravel. Each flood brings down additional material eroded from the banks and deposits it in bars or the bed of the stream, portions being carried by succeeding floods to the Illinois River.

As the valley is subject to overflow at extreme floods of Farm Creek, a new channel was constructed through East Peoria in 1895 after several years of agitation. This channel, 60 ft. wide on the bottom and with levees rising 12½ ft. above channel grade, provided protection from overflow until May, 1927, when the levees were topped by the flood and practically the entire village was overflowed to depths up to 10 ft. Streets and sidewalks were washed out. Houses were moved from their foundations, and some were crushed. The flood damage was estimated at $1,750,000.

Rainfall and Runoff—A rate of runoff of 220 sec.-ft. per square mile, or about ½-in. depth per hour over the drainage area, can be carried in the new channel with a freeboard of 2 ft. The levees are wide and will hold with floodline at grade a channel capacity 50 per cent above normal, or 330 sec.-ft. per square mile. The nearest rain gage is at the U. S. Weather Bureau in Peoria, about 8 miles from the center of the Farm Creek drainage area. On the day of the 1927 flood the rainfall at the gage was 2.60 in. in about four hours. The records at Peoria show 4 in. of rainfall in four hours three times in twenty years. Local information indicates that 4 in. or more fell on the Farm Creek drainage area in the four or five hours preceding the 1927 flood. The capacity of the channel at that time was about 8,000 sec.-ft., whereas the capacity of the new channel is about 15,000 sec.-ft. with 2-ft. freeboard. In May, 1927, the open-

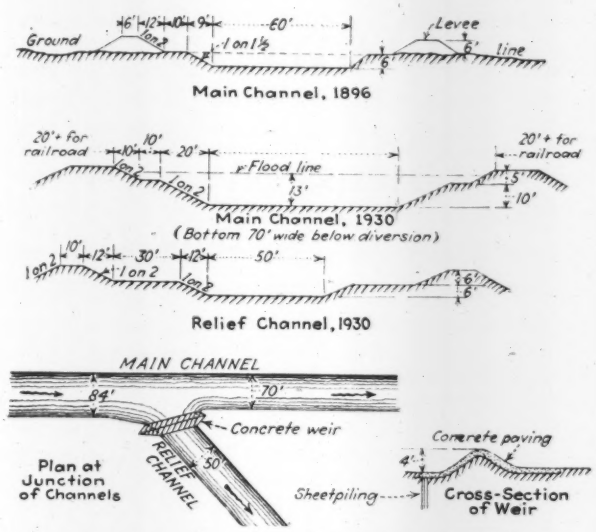


Fig. 1—Sections of East Peoria flood channels

ings in the Nickel Plate Railroad bridge and the East Washington St. bridge were almost completely blocked by drift, causing the water to flow over the levees.

Flood-Control Plans—Soon after the 1927 flood the region affected was organized as the East Peoria Sanitary District, which secured the cooperation of the utility companies and industries having properties in the area and of the state division of waterways and division of highways. Plans were prepared providing for the construction of the following main works: (1) straightening and enlarging the channel for ¾ mile above the work completed in 1896; (2) widening and deepening the channel to a bottom width of 84 ft. with side slopes of 1 on 2 and a water depth of 13 ft., and raising the levees to 15 ft. above bottom of channel, or 2 ft. above maximum flood level; (3) spillway and relief channel north to the Illinois River; this channel has a bottom width of 50, and its entrance is closed by a concrete spillway with crest 4 ft. above channel grade in order to check the flow of sand; (4) channel improvement and construction of levees on small tributaries entering Farm Creek within the village. Incidental works included: (5) lengthening of two and redesign of one of the three highway bridges; (6) raising grade and relocating tracks and overhead electric wires on about 2 miles of the main line of the Illinois Terminal Railroad; (7) raising grade and adding an additional 100-ft. span to the Peoria & Pekin Union Railroad across Farm Creek; (8) raising the Toledo, Peoria & Western Railroad main tracks and constructing a four-track bridge across the diversion channel; (9) relocating about 1 mile of the Nickel Plate Railroad on the north levee, and dedication of the abandoned right-of-way to the village for a public street, the Pekin Union Railroad bridge across Farm Creek; (10) raising the grade of state highway No. 8 and constructing a bridge with 40-ft. roadway across the diversion channel; (11) constructing an additional span to the Illinois Terminal Railroad bridge across Farm Creek; (12) reconstructing several electric cable lines, pole lines and high-tension lines.

Cost of Work—These flood-control works will cost approximately $1,200,000, divided among the East Peoria Sanitary District, the state, and the railroad and utility companies. The total comprises the following: land, channel and levees, $315,000; highway bridge construction and extension, $210,000; Illinois Terminal Railroad, $200,000; Peoria & Pekin Union Railroad, $110,000; Nickel Plate Railroad, $40,000; Toledo, Peoria & Western Railroad, $170,000; telegraph, telephone and power and light companies, $155,000. In addition, the Caterpillar Tractor Co. has filled for factory purposes about 80 acres of Illinois River bottom land to an average depth of 10 ft. by hydraulic dredging from an area adjacent to the river, at a cost of about $1,000,000; while the Cedar St. bridge (for four lanes of traffic) across the Illinois River is being built jointly by the city of Peoria and the state of Illinois.

Engineers—Plans were developed by the writer, as consulting engineer for the East Peoria Sanitary District; and the work was in charge of Edwin A. Fitzgerald, as chief engineer of the district.

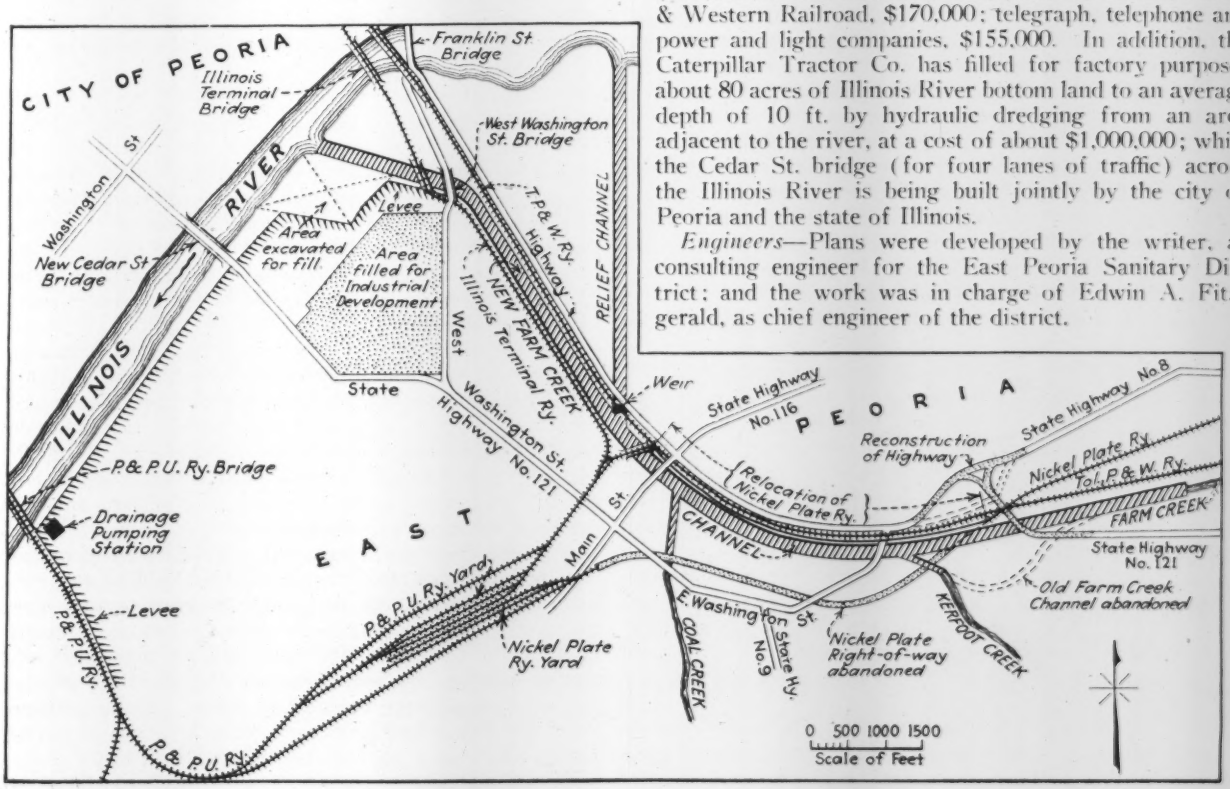


Fig. 2—Location plan of East Peoria flood-protection works

Composition of Earth Dams

Discussion: Part II

Local materials must be used and they largely determine the dimensions of the dam—Core pressure is not the cause of slides during construction—Major settlement occurs while the dam is being built

A GROUP of articles relating to the composition of earth dams was published in the December 18 issue of *Engineering News-Record* with the express purpose of directing attention to a subject concerning which the engineering profession has little definite information. A considerable amount of discussion and additional information developed as a result of the publication of those articles. Part of that discussion was published in our issue of June 11, p. 960. Three other papers are published herewith; still others will be published at a later date. —EDITOR.

Character of Available Material Fixes Core Dimensions

By ALBERT S. CRANE
Consulting Engineer, New York

IT MAY be said that a dam can be built out of anything. But if one is to be made out of ordinary earth by the hydraulic or any other process, and is to be of any considerable height, it must have reasonable dimensions. In order that its cost may not be prohibitive it must be constructed of the materials at hand, so arranged that they will be stable and practically impervious.

A dam built by the hydraulic, or a modified hydraulic, process has three principal parts, viz.: the core, which is the part that makes for watertightness; the up-stream portion, which keeps the core from moving upstream and acts as a protection against the impounded water; and the down-stream portion, which holds the core from moving downstream. In other words, the real dam is the core, and the up-stream and down-stream portions are for the purpose of holding it in place.

As it is necessary to use the materials at hand, it is desirable for economy's sake to use the core materials as they are sluiced out without further treatment. This means that sometimes the core is of coarse material that calls for a thick or wide core, and the up- and down-stream portions may be of moderate dimensions. At other times the core material is very fine and contains a large proportion of clay. This does not require a wide core, but it does call for up- and down-stream portions of large dimensions.

The borrowpit earth has to furnish the material for all parts of the dam. It is impracticable, therefore, to set any definite dimensions for the core without knowing the characteristics of the borrowpit material.

If a very fine clayey earth is to be used, the straight hydraulic process will probably be unsatisfactory. It will form a watertight core, but the up- and down-stream portions will be laid down in a very wet condition and, being unable to bear much load, will be likely to slip and slide.

On the other hand, if gravel or coarse sand is to be used, the up- and down-stream portions will readily drain, and the straight hydraulic process will make a very satisfactory dam. The core in either case should be as narrow as watertightness will permit. It is not of great importance that the core be extremely fine, but if it is, it must be properly sustained.

This brings us—stability being more important than absolute watertightness—to the most important part of the dam, the up- and down-stream portions.

It is customary to speak of the angle of repose of earth. This means nothing unless the amount of moisture and the degree of consolidation are taken into account. A soil that has 50 per cent of voids filled with water is very unstable and requires quite a flat slope for ordinary stability. This same soil has an entirely different behavior if partly dried so that half of the water is withdrawn and consolidated until the voids are 30 per cent of the volume. In this condition it will be quite stable at a very much steeper slope than would be possible under the first condition.

It should be clear that the up- and down-stream portions that furnish the stability should be as dry and as well consolidated as practicable and should have the inclination of the slope determined by the condition of the material.

It seems, therefore, that having a good foundation and borrowpit materials of known characteristics, one should first determine the effective size and the permeability of such core material as can be washed out. With this information one can compute the desired width of the core. This should be as small as practicable because the outer portions of the dam rest in part upon the core. If the core is very wide, the slopes must necessarily be quite flat, and conditions will be favorable for the outer parts of the dam to slide.

If the core material is very fine, that is, if it has an effective size much smaller than 0.01 mm., it will probably never dry out entirely. It may, after a time, become as firm as is possible for a very fine material containing 50 per cent by volume of water and weighing about 120 lb. per cubic foot. It will, however, flow under pressure, and the up- and down-stream portions of the dam must be designed to retain it in position.

Now the method of construction should be determined. The borrowpit material that furnishes the core also furnishes the rest of the dam. If the core is very fine, the rest of the material will probably, but not always, be fine, and it will be desirable to build the up- and down-stream portions by some method that does not require the addition of large volumes of water. These portions must be consolidated, or they must be given very flat slopes.

If the material is coarse or self-draining, it may be difficult to get sufficient core material, but the other parts

of the dam may be built by the straight hydraulic method or otherwise.

The foregoing may be summarized by saying: The cores of dams built by the hydraulic process should be only wide enough to be practically impervious; they may be of any fineness; they will never entirely dry out; they will never of themselves have much stability; and they will always flow under moderate pressures.

It is of the greatest importance, then, that the up- and down-stream portions of the dam should be well consolidated and, whether self-draining or not, should have stability enough to retain the core. Ordinarily, the up-stream slope should not be steeper than 1 on 3, and the downstream slope should be no steeper than 1 on 2½. These slopes, however, may vary considerably with the materials.

When the dam is being constructed and just before the segregation pool is removed is a very critical time. Then the core has the least support from the up- and down-stream portions, as they are then the narrowest and are resting on recently placed material that is in the process of being consolidated. The slides at the Linville and Saluda dams occurred at this stage of the construction and let out the water of the segregation pools, the escaping water doing many times as much damage as the slides themselves. Slides of this nature, however, are construction incidents and have little to do with the general stability of the dam.

The foundation has been mentioned only casually. It should nevertheless always be borne in mind that it is very important to have a good unyielding foundation even for an earth dam.

* * *

Slides During Construction Are Not Due to Core Pressure

By FRANK H. COTHRAN

Vice-President and Chief Engineer, Beauharnois Construction Co., Beauharnois, Quebec

EARTH DAMS have been used by man for diverting and impounding water as far back in time as history records his achievements, and probably since his very earliest activity. Notwithstanding the use of them for thousands of years, the design of earth dams is today other than an exact science and will most likely remain so for additional thousands of years. Efforts tending toward exact solutions of the several features, or even the clear analysis of them, are interesting and helpful, but in the end common sense and experience must be the final resort.

In approaching this subject three major considerations in a general way present themselves, and they are assumed to be: (*a*) sufficient spillway capacity to prevent overtopping; (*b*) after satisfactory foundation considerations, impermeability—or such a degree of impermeability as will assure the entire loss of head of all seepage that passes through the dam, so that its capacity to carry away particles is destroyed; and (*c*) slopes that will be stable against slippage under all conditions.

The multiplication of data on streamflow measurements, rainfall and runoff have now furnished a fair guide to the designer in the consideration of the maximum floods to be anticipated, and the future will further refine these data. While percolation must be kept within limits that will incapacitate the flow for damage (and not many earth dams have failed due to excessive seepage), there is no more or less exact method of determining the necessary thickness or nature of material requisite for this purpose. The determination of the proper angle of slopes enters seriously into the stability and cost of the structure; still, it is not susceptible of close analysis.

It is not the present purpose to deal with earth dams in the broad sense, as above set out, except in so far as is involved one tendency of one type of earth dam—slippages and the semi-hydraulic fill.

Slips on semi-hydraulic fills have generally been attributed to either core pressure or to slopes that were too abrupt. Slopes, the nature of the materials constituting them and in some cases their adequate drainage are so interrelated that they must all be considered together, as well as the fact that almost any material is stable on some slope. Likewise, cores vary widely in their behavior. Cores of some types of material partly consolidate and give up at least a part of their water comparatively early. Into such cores when freshly laid down a man is able to force a 1-in. pipe only to a depth of some 10 to 15 ft., whereas in one other on record penetrations of 90 ft. or more were attained. The pressures exerted in the two cases above recited must have varied widely, as did, no doubt, the material of which the cores of the dams were made up.

The purpose of the slope, or the material between it and the core, is to hold the core in place. Therefore core pressure is assumed to exist. It is, however, the writer's opinion that in many cases slips, considered otherwise, are of an entirely superficial nature and have no relation to the core. The semi-hydraulic fill during construction is peculiarly vulnerable to this type of slip, and furthermore it is subjected during construction to the worst condition in so far as slips are concerned that it ever has to undergo.

While some materials that cannot be adapted to hydraulic fills can be successfully used in the semi-hydraulic fills, the essential difference, disregarding methods of construction, between a hydraulic-fill dam and a semi-hydraulic-fill dam is in the extreme outside portions of the structures. The hydraulic fill grades from the coarsest materials on the extreme outside to the finest in the center. This segregation, of course, is brought about by the water in which the material is transported and laid down. The semi-hydraulic fill is built usually by dumping material from trestles erected on the slopes, at the successive stages, until the trestle is filled, and then by dumping along the slopes of the fill, from which it is washed by hydraulic monitors into the segregation pool. The water treatment begins within the dam at a distance from the slope line fixed by the height of the trestle and by the slope the dumped material will stand on, or somewhat less when the washing encroaches on the bank made by filling the trestle. Consequently, in all cases the structure has an outside skin that is as tight and as incapable of drainage as is the whole material of the borrowpits without segregation. Or, to state it in another way, a semi-hydraulic fill is a hydraulic fill with the addition of an outside skin or blanket of material, which has not undergone water treatment and which is usually more nearly watertight than the zone next adjacent toward the center of the dam.

The segregation pool in both types of dams is carried upward within the section as construction proceeds from the base or foundation to the top of the dam, and the two types of dam are identical in nature within lines that would delineate on the section the area within which the material is all laid down in the water of the segregation

pool during its upward travel through the course of construction.

In a general way, segregation of the materials begins in the semi-hydraulic fill when the material washed down reaches the edge of the pool. The coarsest of the particles stop on comparatively steep slopes upon reaching the pool, and the fines move out to a more nearly horizontal plane toward the center of the pool. That is to say, the segregation pool does segregate; the fines being taken out to make the core and the coarser materials being laid down in the two opposite edges of the pool, thus making the zones of porous material between the core and the outside blanket composed of the unseparated and tighter materials. Segregation also takes place in the zone from which the material is washed by the monitors, leaving the very coarsest of the material, which still further widens the porous zone.

The section shown as Fig. 1 is not any one dam but is in a general way a composite of several with (for the purpose of clarity) some lines and figures added by deduction beyond any actual data upon which to base them. The behavior of the several dams in consideration was very similar.

The section shows one typical cross-section and the water elevation in the pool for each lift or trestle height of the dam. The location of samples taken and the percentage of the sample that passed a 100-mesh sieve also is shown. An irregular line indicates the approximate outside edge of the pool at its different stages, and an additional irregular line shows the approximate outside limit of the area from which material was washed.

On Fig. 2 three areas have been hatched to show core, coarse material or residue from segregation, and the more or less tight outside skin composed of the whole material.

The sections show the current practice of making the upstream slope flatter than the downstream slope on account of the presence of water and the consequent saturation. It is also well understood that the weight of the water is a stabilizing factor, and that if the water should be quickly drawn out there would be a tendency to slips from the upstream slope.

A fairly representative slip from some of the dams in consideration is shown in Fig. 2. The so-called porous zone is always in contact with the water of the segregation pool. It is assumed that the porous zone will permit the passage of water, and that the outside skin is of such fineness that it will not drain, also that it is not stable when saturated on a 2½-to-1 slope. It is apparent from the section that there is ample opportunity for saturation of the tight outside skin and even direct pressure for the beginning of the movement.

The proper trimming of the slopes and the protection against leaving places for rainwater to collect around trestles and elsewhere are helps toward stability, but the tendency first mentioned is constant. It is the writer's opinion that for semi-hydraulic-fill dams built of material such as prevails in the Piedmont section of the South Atlantic states the most constant tendency to slipping is the presence of water under a head in the porous zone immediately behind the thin outside skin of material incapable of drainage unaided. This is true of dams of the semi-hydraulic type in that section that have had slides. Core pressure was not involved in these slides.

Frequently the abutments and foundations of the natural material in place will permit the passage of water more freely than the dam. After the dam is finished and the reservoir full, water may find its way to the porous zone by passing through the foundation and through the original ground that forms the abutments. While this tendency is always present, judicious drainage through the outside blanket will largely reduce or eliminate entirely the hazard of this type of slip. Drainage should be provided, but if during or after construction, evidences

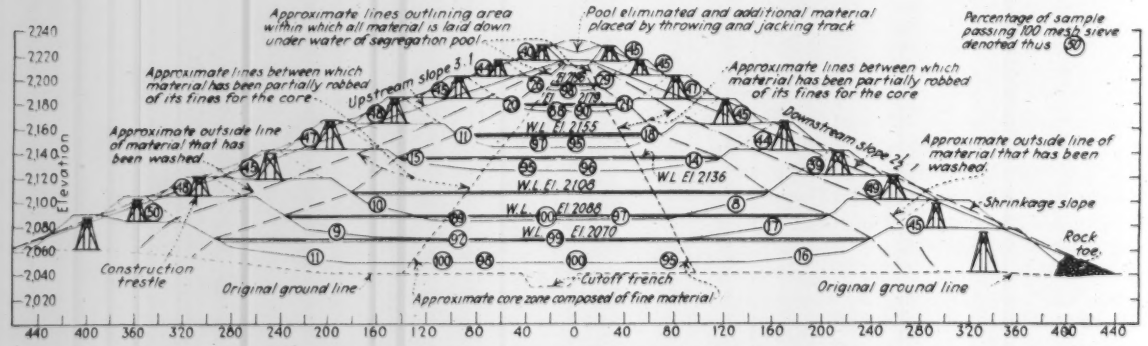

Approximate lines outlining area within which all material is laid down under water of segregation pool
Pool eliminated and additional material placed by throwing and jacking track
Percentage of sample passing 100 mesh sieve denoted thus (50)
Approximate lines between which material has been partially robbed of its fines for the core
Upstream slope 3:1
Approximate lines between which material has been partially robbed of its fines for the core
Approximate outside line of material that has been washed
W.L. El. 2155
W.L. El. 2109
W.L. El. 2136
Downstream slope 2½:1
Approximate outside line of material that has been washed
Shrinkage slope
W.L. El. 2088
W.L. El. 2070
Rock toe
Construction trestle
Original ground line
Cutoff trench
Approximate core zone composed of fine material
Original ground line
Elevation
2240
2220
2200
2180
2160
2140
2120
2100
2080
2060
2040
2020
440 400 360 320 280 240 200 160 120 80 40 0 40 80 120 160 200 240 280 320 360 400 440

Fig. 1—Section of a typical semi-hydraulic-fill dam

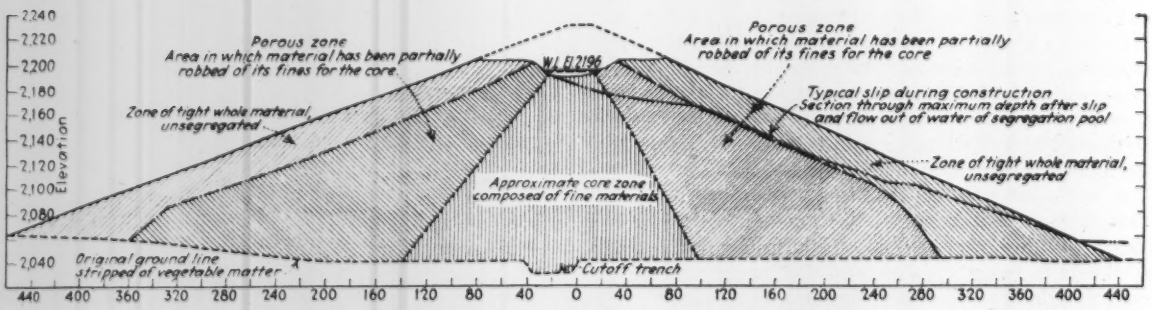

Porous zone
Area in which material has been partially robbed of its fines for the core
W.L. El. 2196
Porous zone
Area in which material has been partially robbed of its fines for the core
Typical slip during construction
Section through maximum depth after slip and flow out of water of segregation pool
Zone of tight whole material, unsegregated
Approximate core zone composed of fine materials
Zone of tight whole material, unsegregated
Original ground line stripped of vegetable matter
Cutoff trench
Elevation
2240
2220
2200
2180
2160
2140
2120
2100
2080
2040
440 400 360 320 280 240 200 160 120 80 40 0 40 80 120 160 200 240 280 320 360 400 440

Fig. 2—Normal distribution of material in a semi-hydraulic-fill dam

of saturation become apparent, immediate steps should be taken to supply drainage. This can be readily accomplished by driving small tunnels into the skin and backfilling them with crushed or broken stone, gravel or any other material of like nature.

This type of slip is purely superficial and generally but an incident of construction, without significance as to the safety of the structure as a whole.

* * *

Major Settlement of Dam Cores Occurs During Construction

By A. C. EATON

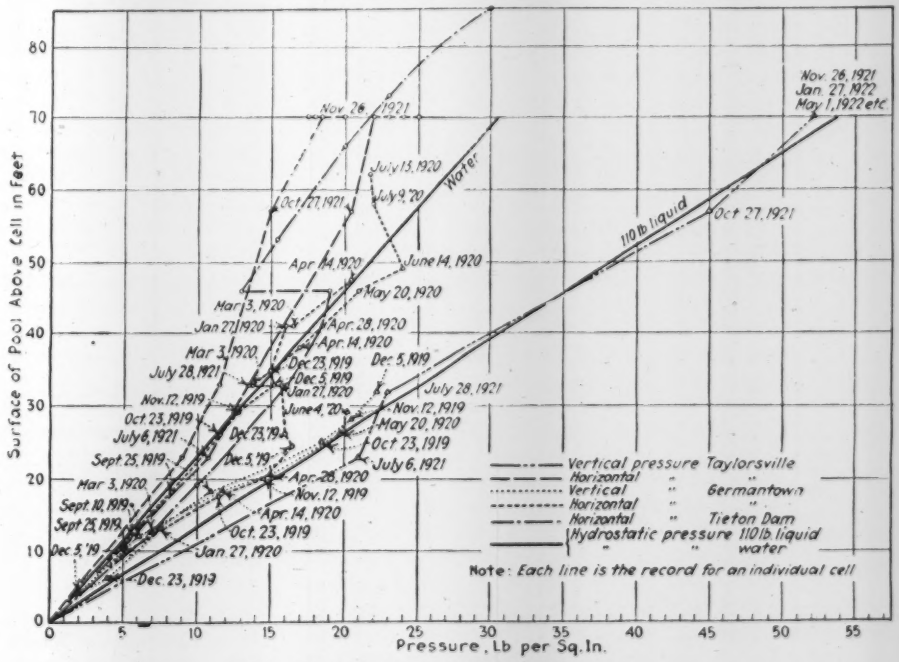
Hydraulic Engineer, New England Power Construction Co., Boston, Mass.

IT SEEMS to the writer that the editorial comment on the composition of earth dams (*ENR*, Dec. 18, 1930, p. 951) rather distorts the subject by the excessive use of such phrases as "opposing demands of tightness . . . and stability," "anxieties that beset the builder of dams and dikes," "many unforeseen mishaps," "leaks through such earth masses" and "accumulated record of great slumps and mud flows."

These are all matters to be kept constantly in mind in the building of an earth dam; but, after all, the more vital elements to be doubly sure about are the related matters of foundation conditions, structures adjacent to or through earth dams and safe provisions against floods. The completed earth dam considered by itself has a pretty clean record in service. The difficulty is the impossibility of separating the main earth structure from the point of weakness when anything happens. It seems timely in discussing the composition of earth dams to emphasize that the most vital considerations are the questions of foundation and related structures. Mistakes in handling and treatment of earth materials may cause delays and extra expense in building, but once completed the principal concern is likely to be from subsurface foundation conditions or improperly designed or constructed structures under or through the earth dam, which may cause the failure of the whole after it is put into operation.

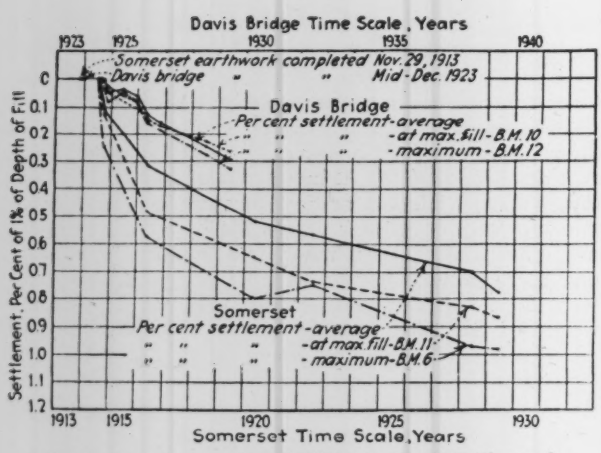
Interesting results are shown in the diagram of recorded pressures (reproduced herewith) given by C. H. Eiffert in his article on the Germantown dam and, I believe, lead to conclusions contrary to the general conception of the character of core material during the construction period. Many engineers believe the sluiced core of a dam is a muddy fluid during the construction period and possibly for a long time after completion; in general, the belief seems to be that this core exerts hydraulic pressures equal to the vertical pressures at the respective depths. However, the diagram referred to indicates horizontal pressures at the smaller depths more nearly equal to water pressure than the pressure of a fluid in excess of water pressure. Even at a depth of only 20 ft. below the surface of the pool this is true, while the vertical pressure is nearly twice this amount. At greater depths the horizontal pressure drops below water pressure. This appears to indicate that the mud does not act as a fluid. As the particles settle down and come into contact with one another the weight of the solids must be carried vertically down to the foundation, while the water filling the voids acts hydrostatically. As the pressures become greater and the materials more compact the voids must still be filled with water. These several facts and assumptions prompt the following questions: Why is the indicated horizontal pressure less than water pressure? In the process of solidifying does the water become entrapped in the minute spaces where its weight is carried by the solid materials to the foundation? Isn't it possible that the horizontal pressure is not a water pressure but an earth pressure with the effect of the water eliminated through the process of solidifying?

Samples taken from the Germantown dam showed that the core had stiffened or solidified to a considerable extent. The writer agrees with Mr. Eiffert in that part of his third conclusion (p. 957) that says that there is likely to be very little change in the future. However, if this is based on the comparison of results obtained in the 1927 tests with the results obtained at Englewood dam as the construction approaches completion, it would seem as though the basis were in error for the following reason. The water content of the 1927 Germantown samples is given as approximately 25 per cent, *expressed in percentage of dry or solid matter*. With the additional data given, this reduces to a 40 per cent void. On the other hand the moisture content of the samples taken



Recorded pressures in hydraulic-fill dam cores

Reproduced from Fig. 1 of an article on the core material at Germantown dam, published in *ENR*, Dec. 18, 1930, p. 954.



Rates of settlement of earthfill in the Davis Bridge and Somerset dams

Reproduced from Fig. 3 of an article on settlement records of two earth dams, published in *ENR*, Nov. 14, 1929, p. 769.

at Englewood was about 24 per cent and the weight per cubic foot about 121 lb. It is evident by computation that in this case the 24 per cent moisture is 24 per cent of the *total water and solid matter combined*, which gives a void in the samples taken at that time of about 46.5 per cent. This seems like a material difference in water content and indicates that the Englewood dam was still solidifying at the time the samples were taken.

Referring to the diagram in the article by J. Albert Holmes (*ENR*, Nov. 14, 1929, p. 769, reproduced herewith), it is evident that the Somerset dam core was settling at a rapid rate at the time of completion and for several months afterward. The data show that after two years the rate had materially reduced. The small amount of settlement in sluiced cores after a relatively short period following construction bears out the author's conclusion that there will be very little change in these cores in the future.

Referring further to Mr. Holmes' diagram, the impression at first glance is that the settlement of the Davis Bridge core is less than Somerset, which is true in terms of percentage of depths. However, other facts furnish food for thought. The Davis Bridge dam is 200 ft. high, and the core was placed in eight months; while Somerset dam is 100 ft. high and had the core placed in sixteen months. The former was raised four times as fast as the latter—the maximum amount being 40 ft. in one month. When one stops to consider that at the completion of the Davis Bridge dam the pressure at the bottom of the core must have been 11 tons per square foot and at an elevation of 100 ft. above the bottom at least 5 tons per square foot, it is not difficult to believe that at the date of completion the lower 100 ft. had received most of its settlement. We find that the actual settlement for six points on the Davis Bridge dam, covering a distance of 500 ft. where the depth of core is from 100 to 200 ft., has been 0.5 ft. for the period of six years following completion, as compared with 0.65 ft. for a single point on the Somerset dam where the depth of the core is 100 ft.

The writer believes the sluiced core of a dam has obtained most of its settlement by the time the dam is completed and that the relatively small amount of settlement following completion is in the upper part, possibly the upper 30 or 40 ft., where the pressure is 2 tons or less per square foot. Exceptions may be found in cores that are largely composed of clay and with no particles larger than the minimum sand size of 0.05 mm. The Calaveras and Alexander dams are examples of such extremely fine material, not only in the core but for most of the cross-section of the dam.

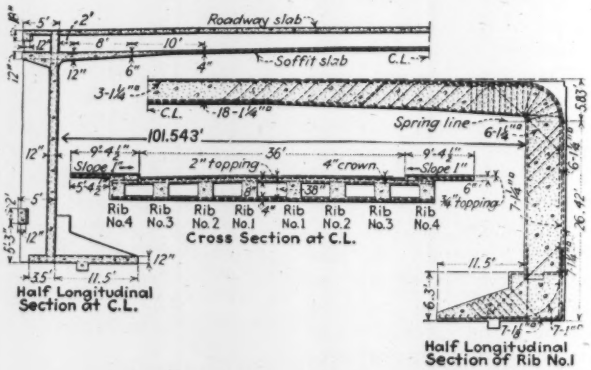
The article on materials in existing earth dams by E. W. Lane contains much interesting and useful data in the tabulations and diagrams. Mention is made of the Sherman dam, particularly with reference to the results because of the relatively coarse material in the core. The Sherman dam in service shows no leakage and is fully as satisfactory as the Somerset and Davis Bridge dams on the same stream. It should be noted that the Sherman dam core contains 35 per cent of material that passes a 200-mesh sieve. The writer quite agrees that "almost any material of which 65 per cent passes a 100-mesh sieve makes a satisfactory core." However, he feels that this statement should not be taken as being the limiting point for satisfactory material, and that materials with considerably less than 65 per cent passing 100-mesh sieves may be highly satisfactory providing the material indicates a good grading of sizes and furnishes a good percentage of material passing a 200-mesh sieve. With further reference to the Sherman dam, investigation of borrowpit material indicated only about 20 per cent that would pass the 100 sieve and less than 50 per cent smaller than 1 in. in diameter. This type of material requires particular attention to thorough sluicing to obtain the necessary fines for the core.

Rigid-Frame Bridge of 101-Ft. Span at San Antonio

Longest concrete structure of this type yet built utilizes unusually shallow ribs by virtue of special cantilever footings—Concrete designed for 3,000 lb. and stressed to 1,200 lb. in bending

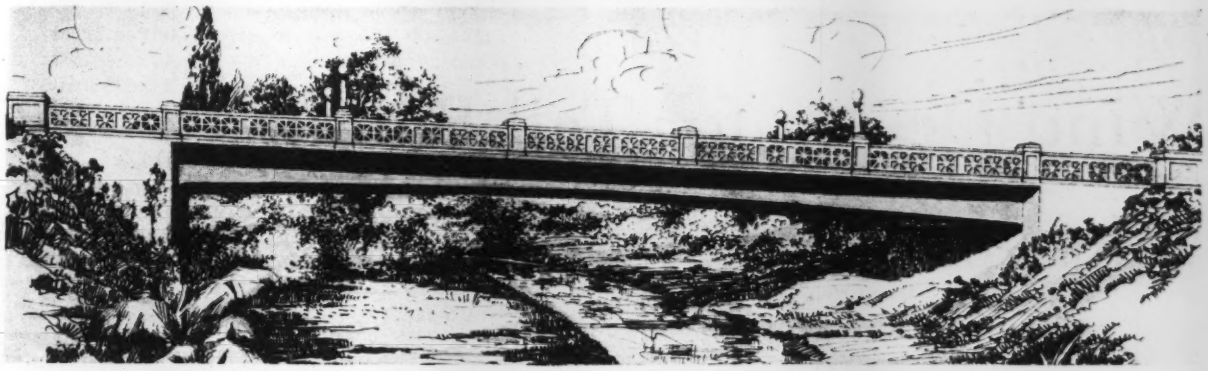
By JOHN W. BERETTA
Consulting Engineer, San Antonio, Tex.

THE BRIDGE across the San Antonio River at Martinez St., San Antonio, Tex., is a rigid-frame structure of concrete with a clear span of 100 ft. between abutments along a 10-deg. skew, producing a length of rib 101 ft. 6½ in. between abutments. From the records available it appears that this bridge has the longest



Sections through longest rigid-frame concrete bridge

Positive bending moments near center of span resisted by T-section of roadway and rib; negative moments at abutments resisted by inverted T-section of soffit and rib. Soffit made continuous to pass floodwaters easily.



Martinez St. bridge, a 101-ft. span, rigid-frame concrete structure at San Antonio, Texas

single span of any rigid-frame concrete bridge heretofore built.

The over-all width of the bridge is 54 ft. 9 in., which provides for a 36-ft. roadway and two 8-ft. sidewalks. The roadway is supported on six ribs 2 ft. wide and 6 ft. on centers. The sidewalks are each supported on one rib, a part of the sidewalk being cantilevered beyond the outside face of the rib. The total depth of the structure at the center is 38 in.

In designing the structure the full maximum live-load stresses plus 30 per cent impact from a train of 15-ton trucks headed by a 20-ton truck was used, assuming that this total loading was carried on any two ribs. Since it was found that the dead-load stresses amounted to approximately three times the live-load stresses, it was desirable to secure as light a structure as possible. In order to reduce the dead-load stresses it was decided to use concrete with a 3,000-lb. 28-day compressive strength and to adopt the rib type of construction. Unit compressive stresses of 1,200 lb. per sq.in. on the concrete in bending and 18,000 lb. per sq.in. for the reinforcing steel were used. The allowable unit shear stress on the concrete without shear reinforcement was 90 lb. per sq.in.

In using the rib type of construction the roadway slab was figured as a T-section in those parts of the rib where the bending moment was positive. Near the abutments where the bending moment was negative a soffit slab was used to act as an inverted T-section. This soffit slab was extended across the entire bridge in a thinner section in order to provide a smooth surface for the passage of water when the river is up, and also to prevent branches and debris from catching on the ribs during periods of high water. The thinner section was not assumed to add any structural strength to the frame. This type of construction, being cellular, has an added advantage in that utilities, conduits, etc., may be run through the bridge under the roadway.

A fillet was provided at the knee to relieve the compressive stress at this critical point, and in addition some compressive steel was used as an extra safeguard. In order that the T action should be reasonably assured to carry through at the junction of the span ribs and the abutment ribs, the soffit slab was continued across to the outside face of the abutment rib, thereby, in a way, converting the compression in the slab into shear and transferring the shear into the rib. In the same way the abutment slab, which acts as a T for the abutment rib, is extended up to the top of the span ribs with the same object in view as the extension of the soffit slab across the abutment ribs.

The soil on which the structure rests is a good clay, and the imposed load is approximately 3,000 lb. per sq.ft., which is a very conservative figure. The footing was anchored against slip by placing a fin or rib on the bottom at right angles to the span ribs.

A cantilever footing made necessary because of the shortness of the abutment rib as compared with the span length, represents a departure from ordinary design. By supporting the frame inside the center line of the abutment the negative corner moments are decreased and the positive center moments increased. This made for a more uniform distribution of the moments and thereby enabled the designer to proportion the frame with less change in its thickness. This is an advantage with respect to design as well as construction. However, this eccentric arrangement of the support increases the deflection in the span rib.

The Martinez St. bridge was designed in the office of J. W. Beretta, Engineers, Inc., San Antonio, Tex., for the city of San Antonio. I. Ewig is city engineer. W. E. Goor, vice-president of the firm, was the designer, and A. E. Searles resident engineer. Phelps & Dewees, San Antonio, were consulting architects, and J. G. Jeffrey, general contractor, San Antonio, was the successful bidder. The total cost of the structure was $35,452.31, which includes engineering and the precast concrete hand railing.

Scientific Traffic Regulation Speeds Up Vehicle Travel

Results of the effort to reform modern city traffic through scientific investigation indicate success beyond even the hopes of the traffic engineers who performed the work, according to the reports just received by Harvard University's Erskine traffic bureau.

Adoption of the scientific traffic code in Chicago has brought about a 33 per cent increase in the volume of traffic which the central district streets are able to handle. Abolition of parking in the Loop, for example, has been an actual stimulus to retail trade and has speeded up the general rate of vehicle travel.

Increase in speed from 13.2 miles an hour to 16.3 miles an hour is reported in the central section of Kansas City following operation of the bureau's recommendations there. Mid-day traffic has stepped up from 16.3 miles to 19.6 miles an hour. Street car movements, the city's public service company reports, have speeded up so that car riders effect a time saving of 25 per cent, or 8,757 hours for the quarter million passengers entering and leaving the business district.

Expert Testimony on

Wind Design for Tall Buildings—IV

* * *

An Analysis of Some Basic Assumptions

By CLYDE T. MORRIS
Professor of Structural Engineering, Ohio State University, Columbus

THE excellent review of the methods of design of very tall buildings to resist stresses and distortion due to wind, in *Engineering News-Record* of Feb. 19, 1931, deserves more than passing notice. It correctly emphasizes the fact that wind design of the unusually tall building requires an especially careful check of basic assumptions if it is to be economical and satisfactory. Wind pressure, deflection, member rigidity, and the rôle of walls, partitions and floors among other things need to be considered with the utmost care and our views regarding them recast if necessary.

Wind Pressures

The usual building-code requirement of a wind pressure of 20 lb. per sq.ft. contemplates a steady wind of less than 80 m.p.h.. The table published in the first progress report of the committee on windbracing of the American Society of Civil Engineers, which was presented at the annual meeting last January, seems to justify even higher unit pressures than that. It is, therefore, gratifying to note that the structural engineers responsible for the design of the recent high buildings in New York City have used for the upper portions of those buildings unit pressures higher than required by the building code.

Sway and Deflection

The permissible sway and deflection of tall structures are receiving considerable attention at present due to reports of discomfort on the part of occupants of the top floors of some buildings constructed during the past dozen years. There can be little doubt that many of these reports are greatly exaggerated due to the psychological effect of pendulous lighting fixtures, to howling of the wind through leaky weather strips around window sashes and to general nervousness in a storm.

In a small inner room without windows, used for storage purposes, on the 37th floor of the tower of the American Insurance Union Building in Columbus, Ohio, a number of plumb bobs are suspended by cords of various lengths. Certain of these pick up considerable motion when the wind blows with only moderate velocity, while others hang practically motionless. In a wind with a recorded velocity of 38 m.p.h. one of the pendulums with a length of about 46 in. picked up a vibration of $7\frac{3}{4}$ in., while at the same time the vibration of the building at that floor did not exceed 1/10 in. The period of vibration of this building must be some multiple of that of a 46-in. pendulum.

The static deflection of the building is caused by the average wind pressure over a considerable period of time, say 5 min., and is only of academic interest because it is not perceived by the occupants of the building. The sway of the building is caused by variation in wind pressure, or gusts; it may become alarming to the tenants, although not amounting to one-tenth the static deflection.

Observations of the U. S. Weather Bureau indicate that gust velocities exceed the 5-min. mean velocities from 17 to 75 per cent and that a reasonable average would be not less than 25 per cent. This would make the 5 per cent increase in pressure assumed by H. V. Spurr (*ENR*, Feb. 19, 1931, p. 331) seem low. However, the period of the vibration of buildings 800 to 1,000 ft. in height would be long, and a movement of 3 or 4 in. in 10 or more seconds would be imperceptible.

Walls and Partitions

The rôle of the walls and partitions in resisting wind deflection and sway has been suggested often as an excuse for reducing the amount of stress taken by the steel frame. This hypothesis will not bear close analysis, because:

1. Hollow-tile partitions are not sufficiently well laid up to resist successfully a horizontal shear of any magnitude.
2. The total deflection in any one story is too small to bring the steelwork into bearing on the hollow-tile partitions; this could only occur with a monolithic concrete partition poured against the steel columns.
3. Interior partitions are often removed or shifted to suit tenants.
4. Outside walls are pierced with too great a percentage of window openings to be effective in resisting lateral deflection.

Floors

The floor construction is entirely different from that of the walls and partitions. The floors are usually of reinforced concrete and are poured directly around and in contact with the steel frame. There are very few openings in them and their effect as diaphragms for distributing wind shear and equalizing the deflections of the various wind frames in the building is unquestionable. It is, therefore, imperative that the wind loads be allocated to the various frames in proportion to their stiffnesses.

Methods of Calculation

Refinements in the numerical calculation of any function are not justified beyond the limits of error in the assumed data, but mistakes in the theory upon which the calculations are based may increase the error of the result beyond permissible limits and should not be tolerated if correct theories are available.

The two most common approximate methods of anal-

ysis of wind stresses, known as the cantilever and the portal methods, give results that may vary from each other and from correct stresses by as much as 100 per cent; these variations are frequently on the danger side.

It is gratifying to note that in all of the recent tall buildings the effect of the relative stiffness of the members of the frame has been taken into account in distributing the moments and shears. This is in accord with the generally accepted elastic theory and is not based upon any arbitrary assumption as to points of contraflexure or distribution of shears.

During the past year there has been made public one of the most valuable tools that is available to the engineer confronted with the design of rigid frames. Reference is made to the paper "Analysis of Continuous Frames by Distributing Fixed End Moments," by Prof. Hardy Cross, which was published in the Am.Soc.C.E. *Proceedings* for May, 1930. After the theory is mastered, which requires but a short time for anyone conversant with structural design, the application to a specific problem requires only the simplest arithmetic, and the time required is only slightly greater than that required for any one of the usual approximate methods. The results may be carried to any degree of precision desired and will check with the results by the elastic theory.

In Professor Cross' paper only vertical loads are treated, but in the Am.Soc.C.E. *Proceedings* for February, 1931, the writer has extended the method to apply to laterial forces on building frames.

In any method of calculation of stresses that involves the principles of the elastic theory, the relative rigidities of the various members of the frame must be considered. If the steel frame were independent of the floors and fireproofing, these rigidities would be proportional to the I/L of the members, but the rigidity of a member incased in poured concrete is increased considerably beyond that of the steel alone. Tests of such composite members, made at the University of Toronto and the Ohio State University, indicate that the action of such members follows closely that which would be indicated by the usual theory of composite members. From this it would follow that the rigidities of the columns, if they are incased in poured concrete fireproofing, should be calculated on the basis of the composite section; and that a portion of the floor slab and the concrete fireproofing surrounding the floor girders should be included in the calculations of the rigidity of the girders in the wind system.

[Restriction of the last paragraph to poured concrete would exclude bricking; but as tests of reinforced brickwork have shown that it behaves precisely like reinforced concrete, and as good brick masonry has a modulus of elasticity about equal to that of stone fireproofing concrete, bricking should also be credited with a stiffening effect on columns.—EDITOR.]

Stone Plant Built as Auxiliary to Chicago Steel Works

Quarry, railroad, crushing and screening mill and private harbor to supply limestone for furnaces of Inland Steel Co.—Electric operation throughout

A SUPPLY of limestone for the blast furnaces and open-hearth steel furnaces of the Inland Steel Co., Chicago, is the primary purpose of a large stone plant established recently at the north end of Lake Michigan by the Inland Lime & Stone Co., which is a subsidiary of the steel company. However, commercial business will also be handled. The project includes: (1) a private harbor at Inland Port, 22 miles east of Manistique, Mich.; (2) an extensive plant for crushing, screening, storing and shipping stone; (3) a quarry 7 miles north of the plant; and (4) a railroad connecting the quarry with the stone plant and harbor. Electric power is used for the quarry, railroad and stone plant. This plant began operation in November, and some shipments were made before the close of navigation, but enlargements will be made during 1931.

Quarry Works—Geologically the quarry is in the Lockport formation of the lower Silurian or Niagaran series, locally known as Blaney stone, which is a gray and buff highly crystalline limestone of high calcium

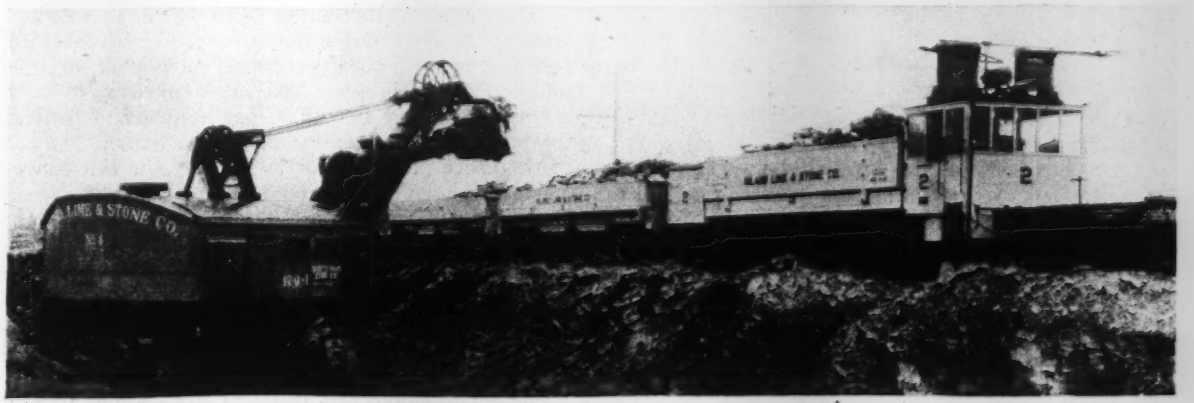


Fig. 1—Quarrying limestone for steel plant, using 5-yd. electric shovel and electric locomotives

Note side-arm trolley for wire 14 ft. from track.

Fig. 2—Stone-crushing and screening plant

Primary crusher house is in middle background. From right to left, in front: grizzly house, secondary crusher house and screen house. Belts running out of side of screen house ascend inclined frame of traveling stacker.

content, weighing about 168 lb. per cubic foot in place and said to be specially suited for metallurgical purposes. The maximum thickness of cover or overburden is 2½ ft., and the stone has a thickness of about 60 ft. A face a mile long is being worked, the entire height of face being quarried in one lift. Blast holes 6 in. in diameter are put down by electric well-drill rigs mounted on crawlers, and the stone is handled by two revolving electric shovels with 5-yd. buckets and also mounted on crawler tractions.

Electric Railroad—Loose stone is loaded by the shovels into 30-yd. side-dump cars, which are hauled in seven-car trains by electric locomotives that also carry 30-yd. dump bodies. The car load averages 50 tons. Each locomotive unit weighs 110 tons loaded and 55 tons empty and is equipped with four 260-hp. motors. At the crusher the locomotive units are dumped by power, but the cars are dumped by a device consisting of levers that engage pads on the bottom of the car body and are operated by a pair of pneumatic cylinders. Cars can be dumped at 2-min. intervals.

The railway, extending 7 miles north form the plant to the quarry and having a 5-mile tangent, has maximum grades of 1 and 2 per cent against loaded and empty trains respectively. A spur to the Minneapolis, St. Paul & Sault Ste. Marie Railway provides for shipping stone by rail. Track is laid with 90-lb. rails on treated oak ties fully tieplated and having four rail-anchors to each rail. The 600-volt trolley wire is at the side of the track, 14 ft. from the center line and 16 ft. above rail level, current being taken by horizontal side-arm trolleys. For convenience of shifting track the trolley poles in the quarry are set in concrete blocks 2 ft. square, so that they are easily handled and placed on the rock floor, with stone or gravel filled over and around the blocks for additional anchorage.

Fig. 3—Two stackers for stone storage yard

The belt conveyor from screen house ascends to top of stacker and delivers stone to lateral conveyor. Top of reclaiming tunnel with roof gates is at left.

Crushing and Screening Plant—Stone is produced in five grades, as follows: 14- to 6-in., for open-hearth furnaces; 6- to 2½-in., for blasting furnaces; and commercial stone of 2½- to 1½-in., 1½- to ⅝-in., and ⅝- to ⅛-in. Trains from the quarry rise on a grade of 1 per cent to a point about 27 ft. above the ground, where the stone is dumped over a grizzly or bar screen with 10-in. spacing and 38-deg. slope. The structural-steel bars of this screen have caps of manganese steel. Under the track is a hopper with a similar grizzly. The train pulls past the dumper and backs up as each car is emptied,

Fig. 4—Stone-reclaiming conveyor

Tunnel under storage yard with roof gates and chutes for delivering stone to reclaiming conveyor.

the locomotive unit being dumped last, thus retaining its 110-ton rating until all the cars are unloaded.

Oversize stone passing over the grizzly goes to a gyratory crusher, the output from which, as well as the stone passing through the grizzly, is delivered to a pan conveyor of manganese steel moving at 40 ft. per minute. This conveyor discharges upon a 48-in. belt conveyor running at 450 ft. per minute and delivering the stone to a hopper in the screen house. An automatic device provides that in starting, the belt conveyor starts first, then the pan conveyor and finally the crusher.

In the screening house the stone passes from the hopper to two live-roll grizzlies consisting of transverse revolving rollers with 6-in. openings. The rolls of one screen have straight grooves, while those of the other have spiral grooves. Oversize stone goes generally to a stacking conveyor for delivery to a stock pile, but it can be diverted to a belt conveyor feeding a pair of secondary crushers, one being of the gyratory type and the other of cone type. Stone passing through the grizzlies is carried to this crusher plant in the same way.

Six vibrating screens (four single- and two triple-deck) are arranged in pairs, with those of coarser mesh above the others, the flow of material being partly by gravity and partly by belt conveyors. The last screen, for $\frac{1}{8}$-in. material, works under a water spray, the water carrying the sludge and dirt through a flume to the lake. The belt conveyors, including those of the stock yard noted later, have an aggregate length of about 15,000 ft. and are 24 to 60 in. wide. Crushers, screens and conveyors are operated from electric motors by means of rope drives; roller bearings are used extensively on this equipment.

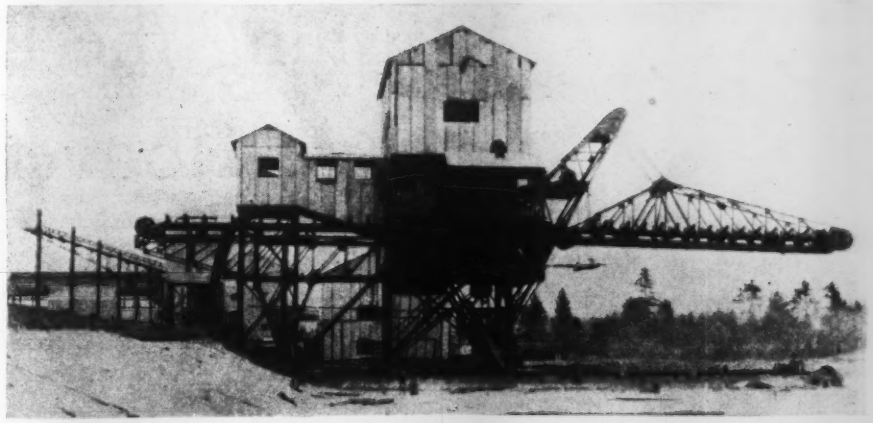


Fig. 5—In the stone loading tower which travels transversely to the dock shown at the right the hinged boom with conveyor can be lowered to reach ship's hatchway

Stone Storage—A storage space about 500x1,200 ft., parallel with the loading dock or wharf, is divided by the tracks for the stackers, which are supported by concrete foundations. Each stacker is a steel-frame inclosed tower about 60 ft. high, having at the receiving end a 50-ft. inclined extension to support the conveyor from the screens, while on the front or discharging side is a 60-ft. boom carrying a belt conveyor at right angles to the main belt. This boom is balanced by a concrete counterweight on the opposite side of the tower. A 40-hp. motor gives a travel speed of 50 ft. per minute, and a solenoid brake of the same power holds the stacker n position while at work.

These stackers are practically large tripping devices, each conveyor belt from the screens rising on the inclined extension of a stacker to pass through the top of the tower, where it discharges its load, the belt then descending to its tunnel beneath the tracks. Stone from the conveyor belt is delivered to a chute that feeds the wing conveyor on the lateral boom.

Control of all motors of the screening plant is centered at one point and includes an automatic device for starting in sequence, as at the primary crusher plant. Thus the discharging or wing conveyors of the stackers are started first, then the main conveyors from the screens or hoppers to the stackers, then the vibrating screens and finally the live-roll grizzlies. The several motors start at successive intervals of 30 sec., so that each piece of apparatus clears itself of any accumulated material before the next one starts. Stopping is done in reverse order, the grizzlies first and finally the last stacker belt.

Reclaiming and Loading—Under the center line of each storage area is a concrete tunnel with loading gates about 20 ft. apart along the roof, by which the stone in the stock piles is drawn down and fed upon a 370-ft. belt conveyor. These four reclaiming conveyors, in two tandem pairs, end at a transverse tunnel between the pairs and discharge into hoppers that feed a 487-ft. transfer conveyor, this in turn feeding a 160-ft. inclined conveyor equipped with an automatic weighing device. The transfer conveyor has a capacity of 3,000 tons per hour, sufficient to handle stone from any two of the reclaiming conveyors.

From the inclined conveyor the stone is delivered to the loading house, which has a 32- and a 105-ft. conveyor with capacities of 250 and 3,000 tons per hour, respectively. The first is for loading dust, sand and fine waste material into railroad cars, while the second or shuttle conveyor is for loading stone into ships. This shuttle or loading conveyor is mounted on a tower or frame that travels on a track at right angles to the dock line. The frame is in two 48-ft. lengths, the rear part being fixed and horizontal, while the forward part is hinged and can be lowered through an angle of 25 deg. so as to reach the ship's hatchway and thus reduce the drop or fall of the stone.

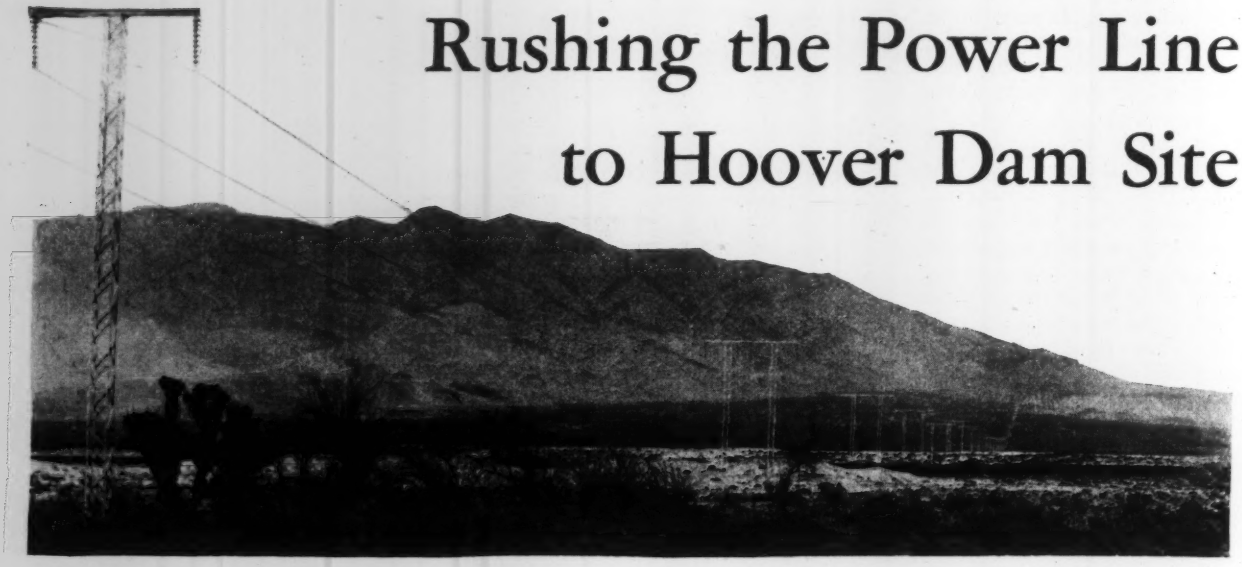
Harbor and Dock—To serve its stone plant the company has established a private harbor known as Port Inland under permit of the U. S. War Department. An area of about 65 acres is inclosed by a rubble-mound stone breakwater having a shore arm 1,478 ft. long, a lake arm 750 ft., and a diagonal arm 1,450 ft; or a total length of 3,678 ft. This basin will be dredged to a minimum depth of 22 ft. For shipping stone there is a dock or wharf 900 ft. long and 600 ft. wide, with a concrete dock wall for 700 ft. and timber cribwork for 200 ft. A sandfill behind the wall and over the conveyor tunnels forms the storage space for stone. Along the dock there is 22 ft. of water for 200 ft. and then 16 ft. for 200 ft. From the dock wall to the breakwater the width of basin is 1,700 ft.

Design and Management—For the stone crushing, screening and handling, the general plant layout was planned by the Stephens-Adamson Manufacturing Co., Aurora, Ill., manufacturer of the conveyor equipment, in consultation with W. Sykes, assistant to the president of the Inland Steel Co., and A. J. Cayia, superintendent of the Inland Lime & Stone Co. For the marine work Major Rufus W. Putnam, Chicago, was consulting engineer. General supervision was under Clarence B. Randall, vice-president of the Inland Steel Co. and president of the Inland Lime & Stone Co., Chicago.

May Predict Earthquakes

Prediction of earthquakes may become possible, said Prof. Alexander McArdle, director of the Blue Hills Observatory, of Harvard University, in a paper read recently before the Eastern section of the Seismological Society of America. Referring to the Tokyo earthquake of Sept. 1, 1923, he said that it is possible, though not certain, that the passage of a great cyclone across Japan started the earthquake by releasing ground stresses that had accumulated to critical amounts.

Rushing the Power Line to Hoover Dam Site



Rugged desert country crossed in 225 days by 225-mile transmission line—Material for substation hauled up road with 17 per cent grade

By R. H. HALPENNY
Electrical Engineer,
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ACROSS 225 miles of desert and mountains, the 132-kv. transmission line to serve Hoover Dam construction activities was built in 225 days by the Southern Sierras Power Co. and was ready to deliver power on June 13. Care in organizing the construction program and proper coordination of material delivery and field distribution along this extended line of operations were notable. The 15,000-kva. terminal substation was constructed during the same time at a site on the canyon rim within 700 ft. of the Nevada abutment of the dam, using a temporary construction road with 17 per cent grades. Completion of this $1,500,000 project provides primary power that will be distributed by secondary lines for use at Boulder City and various points of construction. The line was designed to permit its use for transmitting power back into the company's system when the plant at the dam is placed in operation.

Preliminary—Award of contract (Oct. 28, 1930) by the government to deliver all electric energy needed for the construction program centering at Hoover Dam allowed the company 240 calendar days for completion of the work. Within this eight months period 225 miles of transmission line was designed and built from San Bernardino, Calif., to the Nevada side of Black Canyon. Three days after the signing of the contract survey parties were in the field for final location of the line, which had already been established as to general route. Right-of-way difficulties were not serious, much of the line traversing publicly owned desert and mountainous land. Within six weeks crews had begun excavation for bases and the first consignment of steel had been received.

Construction programming included the establishment of eight material depots with temporary warehouses at points on the railroad along the route of the transmission line. Material was dispatched from these warehouses to the field by trucks in scheduled deliveries timed to maintain a proper flow of supplies and equipment to erecting crews.

Because the material for the towers included many small pieces that were essential for uninterrupted erection procedure, special attention was given to the preparation of the steel for shipment. The shipper was required to bundle all tower members in such a way that a complete structure was contained in a certain number of bundles so that breaking of bundles during field distribution with possibility of losing essential parts was avoided.

No roads existed along much of the route. Difficulties were not serious in breaking new roads on the desert sections, but across the mountains the transportation of construction materials taxed the skill of those handling this work. In one section it was necessary to use a truck equipped with winch and cable to negotiate the steep downgrades. The summit could be reached by existing road, and here the end of the half-mile length of cable was attached to a tree and the truck let down the mountainside. Then the cable was reeled in and the process repeated until the grade allowed the truck to continue under its regular brakes.

Field camps of 50-man capacity (occasionally expanded for 80) were provided for construction crews. As many as five of these camps were in operation at one time and every effort was made to provide comfortable accommodations and adequate commissary. Canvas floors in the tents were an aid to cleanliness and were a protection from various forms of desert life. Use of gas from high-pressure tanks for cooking and for heating tents solved the fuel problem and decreased the fire hazard. Although it was possible in most instances to locate camps where water was available, some sites required a water haul of 20 miles. The period of construction fortunately occurred at a time of year when the extreme desert heat was avoided.

One of the camps was used as a field headquarters for the direction of construction operations, which at times extended for 125 miles along the line. In spite of this difficulty a carefully programmed system of records was

maintained so that at the close of each day it was possible to tell exactly the work accomplished during the past 24 hours. These results were transferred to graphic charts maintained both at field headquarters and in the office of the construction engineer at the company office. This arrangement for the rapid reporting of field activities for such a far-flung construction job was particularly helpful and permitted a constant check against prearranged program schedules and the ordering and delivering of materials and supplies.

Field organization involved the use of construction units handling separate divisions of the work, such as hole digging, base setting, steel erecting and conductor stringing. Under this plan two or more units worked out of a camp which was maintained until that section of the line had been completed.

Line and Structures—The transmission line is of single-circuit construction, consisting of 4/0 A.C.S.R. (aluminum cable steel reinforced) conductor supported by galvanized steel structures with an average spacing of 750 ft. The standard support is an H-type structure consisting of two lattice masts 2 ft. square in section supporting a horizontal trussed channel arm 34 ft. long 52 ft. above the ground. The base sections of the masts were designed for earth setting at a depth of 7 ft. in ordinary soil. The lower 4 ft. of the bases taper to a 6x6-in. section because of certain advantages in design and convenience in setting.

Self-supporting structures of A-type towers are used on line angles up to 50 deg., a structure of moderate weight being used from 0 to 25 deg. and one of heavier design and with offset arm for angles between 25 and 50 deg. For angles in the line greater than 50 deg., three vertical, guyed masts are used tied together at the top with a horizontal arm; the conductors are dead-ended directly to the mast. On tangents at least one H-type structure in every mile is guyed. Reinforced anchors of conical design with 1-in. by 10-ft. anchor rods and $\frac{7}{16}$-in. high-strength, double-galvanized steel guy strand are used in guying. The insulator strings consist of nine units in suspension and ten units at dead-ends.

Fig. 1—Route of the transmission line supplying power for Hoover Dam construction

Built by the Southern Sierras Power Co. from its system in southern California, this line ultimately will deliver power produced at Hoover Dam back into the system.

Fig. 2—Digging 7-ft. holes for tower bases

The 30-in. auger hole was squared out by hand at the top to receive the asphalt-dipped footing sections.

Tower Erection—Base sections of the H-type structures and the stubs, or footings, of the A-type towers were assembled in material yards at distribution points and dipped in a hot bath of asphalt. The thickness of the asphalt coating was controlled to some extent by the temperature of the liquid. Although all of the steel was galvanized, it was considered good insurance against corrosion to give the base sections the additional protective coating because of the varied soils to be encountered.

Assembling of bases and stubs at central points resulted in cheaper labor cost than possible with field assembly, since work was done under more convenient conditions and with maximum efficiency. A truck equipped with boom and winch was used to handle the bases during the dipping process.

Digging holes for tower bases was done by tractor-mounted earth-boring machines (Fig. 2) where soil conditions permitted. About 65 per cent of the holes on the entire line were dug with this type of equipment. The bases of the H-structures were of such design that a 30-in. auger hole was large enough after the top of the hole had been squared out by hand. The earth broken down by hand was, for the most part, removed by the auger during the boring operation. More than 30 per cent of the holes required the use of explosives in excavating. Many of the locations required excavation in solid rock, and a portable air compressor drawn by tractor was used in these sections.

For placing bases and stubs, wooden templet bars were used. These templets were equipped with iron plates provided with welded-in bolts to engage the bolt holes in the bases. The operation of setting the two base sections of an H-structure was comparatively simple; the bases with templet bars attached were lifted and placed in the holes by eight men, who afterward leveled, aligned, backfilled and tamped. The A-type tower stubs required more work, since the four legs formed a rec-

tangle and involved a more elaborate templet system and more careful leveling.

The steel erecting crews closely followed the base-setting crews. To expedite the erection, two scouts preceded the erectors and prepared the steel so that it was in convenient position for sending aloft. In addition to breaking open the bundles, arranging the steel and opening the boxes of bolts, these scouts carefully checked all materials to make sure that there would be no delay when the erecting crew started work.

Steel erection gangs consisted of twelve men under a foreman. This gang was split into two crews of six men each, and two adjacent towers were erected at the same time by a gang, four men working aloft (Fig. 3) and two on the ground at each two-mast tower. Ordinarily six crews were employed and the work was arranged so that there was a certain amount of competition among them as to the number of towers erected in a day. An experienced crew of six men could erect four H-structures per day and frequently exceeded this figure. In all cases towers were built up from the ground by first bolting the vertical members of the lower section in position and then adding the diagonal members as the two erectors ascended. This method was used because much of the country traversed by the line was so rough that it would be uneconomical to assemble the towers on the ground and transport and set up the equipment necessary for raising the completed structure. This conclusion was based on cost data obtained on similar lines built within the last two years where very accurate cost comparisons were kept of the two methods. The erecting crew, after completing the tower, hung the insulators and line hardware, installed the bird guards and left everything in condition for the wire-stringing crews.

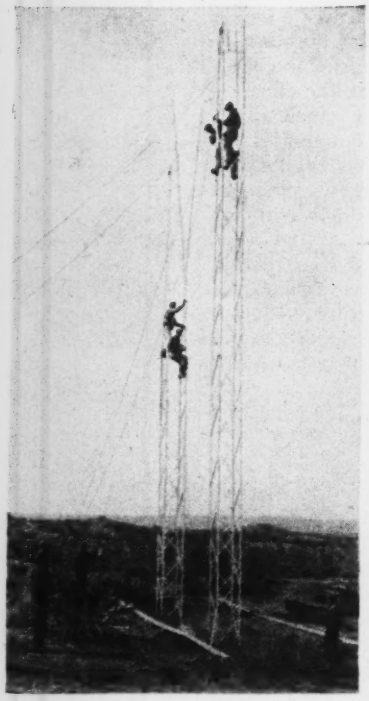


Fig. 3—Building as they climb

Four erectors and two helpers fabricate each 52-ft. tower piece by piece from the ground up. Rough country for much of the distance made assembly on the ground and raising impracticable.

Stringing Conductors — Specially constructed cable reel trailers were used in stringing the conductors. These two-wheel trailers were equipped with pneumatic tires and designed so that reels could be conveniently loaded. Each pay-out reel was drawn by a tractor, which made it possible to use this equipment in very rough sections of the country (Fig. 4). The design of the H-structure made it possible for the three tractors to lay the conductors directly in position under the towers without special handling of the center conductor, required in the case of A-type towers.

As the conductor was paid out it was placed in dollies suspended from the crossarms, and by the time the reels were emptied the conductors were in position for sagging in. The tractors were then made use of for pulling up the conductors to the proper tension. After this operation the clipping-in crew removed the cable from the dollies, placed the armor rods in position and fastened the cable in the clamps. In spite of the fact that tractor haulage of the reels made it possible to lay out most of the cable in this manner, there were numerous sections where the extremely rough character of the right-of-way necessitated a great deal of hand work in paying out the conductors.

For use in the operation of power line and stations an independent telephone circuit was included in the construction program. This circuit, consisting of copper conductors supported on butt-treated cedar poles, was so located as to be accessible for patrol use.

Dam Site Substation—The 15,000-kva. substation served by the transmission line during the Hoover Dam construction program is located as near as possible to the center of project operations. In building this structure the transportation of materials and supplies to the site was the most difficult problem. The location assigned by the government for substation purposes is on the Nevada side of the canyon about 700 ft. from the abutment of the dam. Although the river is easily accessible on the Nevada side at a point about a mile above the dam site by way of Hemingway Wash, the site itself is flanked by massive canyon walls and the adjacent country is decidedly rough and difficult of access.

The railroad and highway being built by the government from Boulder City to the site were not far enough advanced to be of value for transportation of substation materials and equipment. As a result it was necessary to build a temporary road from the floor of the wash to the elevation of the rough, plateau-like area through which the canyon is cut and then continue it over the rough terrain to the substation site. About 2 miles of such road was constructed, the maximum grade being kept below 17 per cent. Two

Fig. 4—Stringing three conductors at the same time

Tractors and pneumatic-tired trailers pay out conductors in rugged desert country. H-towers permit laying center line directly under insulators without rehandling.

Fig. 5—Terminal substation under way only 700 ft. from the Nevada abutment location

Up a construction road with 17 per cent grades materials and supplies were brought to this site; the first compressor was disassembled and packed in.

days after this road was opened (March 23) the camp was ready for occupancy.

While this road construction was going on the excavation of the substation site was being rushed. The rough character of the country and the difficulties overcome in preparing the site can be more readily appreciated by stating that the small compressor used on substation excavation had to be disassembled and packed in. Men and horses were taken in over a barely passable trail. Water had to be hauled and packed for miles. The station was designed with a view to economy of space, but in spite of this fact about 2,100 cu.yd. of rock had to be excavated to obtain a sufficient area for construction.

This substation will deliver 2,300-volt, 60-cycle, three-phase service during the six-year period of construction. Because of this limited period of use the station design was made as simple as possible, but nothing was spared to safeguard service. The 50x80-ft. building is of steel-frame construction, with metal lath and stucco-covered walls. The condenser room, containing two 7,500-kva. synchronous units, is equipped with two 10-ton chain blocks on I-beam travelers. The switchboard room, battery room, shop and storeroom occupy the remainder of the floor space of the building except for an 18x45-ft. room at one end set aside as a bus and circuit breaker room for the equipment to be installed by the government and the contractor.

Erection of steel began seven days after the road to the site was opened, and 50 days later the substation was completed and ready for service.

Four 5,000-kva., 132,000/2,300-volt, transformers, protected on the high-tension side by a 132-kv. automatic oil circuit breaker and lightning arresters of the same rated voltage, comprise the outdoor equipment at the substation. A transfer track and transformer hoist, together with facilities for taking transformer cores into the building for possible repair purposes, have been provided.

Organization—The contract for furnishing power for Hoover Dam construction activity is held jointly by the Southern Sierras Power Co. and the Nevada-California Power Co. Under the general direction of F. O. Dolson, vice-president and general manager of the Southern Sierras Power Co., the project was handled by the engineering and construction departments of this company. The author was in charge of design; E. J. Waugh, construction engineer, was responsible for construction. Field operations were directed by C. H. Rhudy, engineer in charge of line construction, and by H. O. Watts, superintendent for substation construction.

Temporary Dead Load on Arch Reinforcement Provided by Pockets of Gravel

A unique method of erection is reported as having been used on the longest concrete arch bridge in Germany, a two-hinged design with a span of 446½ ft. and a rise of 94½ ft., located at Oberammergau in the Bavarian Mountains. The ribs of the arch were designed on the assumption that structural-steel reinforcement would be used to carry the forms. In order that the steel would be certain to take the full dead load of the arch, the steel arch was loaded with gravel in special forms equal in weight to the dead load of the ribs. Then as the pouring of the concrete proceeded, the gravel was removed. It is believed that this is the longest concrete arch bridge in which the reinforcing system has been designed as a structural-steel arch.

Repairing Concrete Structures

An extensive and painstaking study of concrete structures in service is being carried out by the Hydro-Electric Power Commission of Ontario. According to R. B. Young, testing engineer of the commission, it is the plan to inspect all structures periodically and to study the changes that take place. This is merely a continuation of past practice. Supplementary to this, however, the commission is planning to give much time and thought to the problem of repairing concrete that has already deteriorated. Mr. Young would appreciate information regarding any major repair work that is now under way on concrete structures in this or foreign countries.

Friction Tests on Bearing Plate Materials

Lead bronzes prove superior to harder tin alloys—Machine developed to duplicate field loading—Results change California specifications

By THOMAS E. STANTON
Materials and Research Engineer
California Division of Highways, Sacramento, Calif.

EXTENSIVE tests to determine the frictional properties of various materials for bridge bearing plates recently were carried on in the laboratory of the California division of highways. This research was prompted by difficulties encountered with the established type of polished tin bronze plates and the extreme lack of published data on the subject. To reproduce actual working loads on the plates and permit tests using thousands of movements, a special machine was developed that proved very successful. The immediate result, in addition to the accumulation of many valuable research data, was a change in the California state highway bridge specifications to provide for soft lead bronze bearing plates.

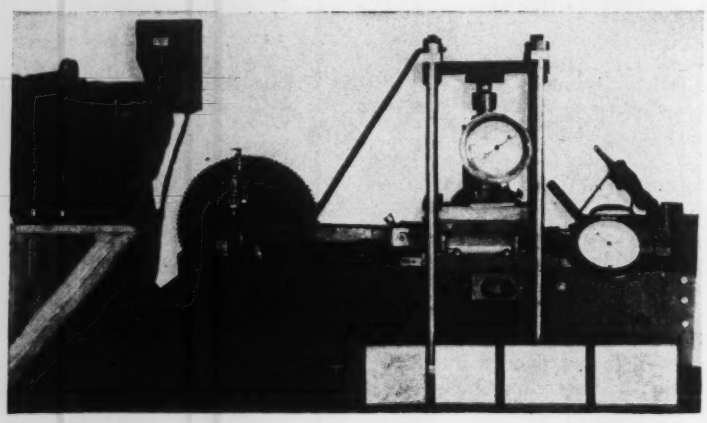


Fig. 1—Testing machine that reproduces actual working loads

Standard practice for several years in California highway bridges of less than 40-ft. span has specified phosphor bronze expansion plates meeting the American Society for Testing Materials standard specifications for bronze bearing metal with a desired chemical composition of copper 83 per cent, tin 16 per cent, phosphorus 0.25 per cent and nickel 0.50 per cent. The plates were specified to be milled, polished and covered with flake graphite when placed. They had a Brinell hardness of 125 under 3,000-kg. load.

Warping, probably due to heat generated in polishing, caused many controversies between inspectors and manufacturers. Field examinations showed defects that produced freezing and lack of free movement between bearing plates. To arrive at some fundamental basis for determining a better type of expansion plate, both as to composition and surface finish, a series of exhaustive laboratory tests was started in October, 1929, by the materials and research laboratory.

Testing Machine—A special testing machine (Fig. 1) was designed and constructed in the shop of the department. The foundation framework consists of two 10-in. channels for carrying the necessary supports for two 18-ton hydraulic jacks, one to exert a vertical load and the other to measure horizontal force, on which base the lower plate of the pair to be tested is held firmly. This lower plate is 8x6x$\frac{5}{8}$ in., while the upper is 6x6x$\frac{5}{8}$ in. Roller bearings on the upper plate carry a vertical jack that applies load. A rod connects the upper plate to an eccentric designed to provide a $\frac{1}{4}$-in. movement between the two plates. A $\frac{1}{2}$-hp. motor geared by a 96-to-1 reduction to the eccentric provides the power for the test. Whenever it is desired to measure the frictional resistance between the plates, the driving mechanism is disconnected and force is applied by a horizontal jack located at the opposite end of the framework.

To eliminate excessive frictional heating and at the same time to keep down the time necessary for extended tests, a speed of nineteen movements per minute was provided by the gear reduction. The apparatus as described proved very successful except for a tendency of the motor to heat up and stop as the friction increased between the plates. As first designed the machine provided for a movement of $\frac{1}{2}$ in., but the stroke was afterward changed to $\frac{1}{4}$ in. without appreciable difference in results other than the formation of slightly less powder due to abrasion. To protect against overloads a circuit breaker was provided; in many cases the test could be continued after the motor had cooled.

Test Routine—The vertical load on the plates was 700 lb. per sq.in., equal to the design load for bridge expansion details used by the bridge department.

The horizontal force required to start movement be-

TABLE I—PHYSICAL AND CHEMICAL PROPERTIES OF MATERIALS

Iden. No.	Physical Properties: Brinell Hardness (3,000 Kg.)	Yield Pt., Lb. Per Sq.In.	Deformation, In.	Lb. Per Sq.In. Required	Chemical Analysis (Per Cent): Copper	Tin	Phosphorus	Nickel	Lead	Aluminum	Iron	Zinc	Undetermined	Material
1	125.0	38,200	0.139	132,000	84.02	15.44	0.18	0.36	Trace	0	0	0	0	Standard phosphor bronze
2	79.0	22,000	0.143	79,200	87.50	9.89	0	0	0.15	0	Trace	2.46	0	S.A.E. bronze No. 62
3	53.8	6,350	0.147	33,900	70.45	4.44	Nil	0	24.99	0	0	0	0.12	Soft lead bronze
4	67.7	10,300	0.146	43,300	79.75	10.51	Trace	0	9.67	0	0	0	0.07	S.A.E. bronze No. 64
5	61.4	13,200	0.150	44,000	72.47	7.43	0.02	0	19.75	0	0	0	0.33	Am. R.R. journal bronze
6	204.0	41,700	0.137	121,200	60.72	0	0	31.00	0	0	8.00	0	0.28	Nickel bronze
7	69.4	14,700	0.146	60,200	86.70	12.95	0.01	Nil	0	0	0	0	0.34	Special bronze
8	127.0	14,300	0.145	103,300	87.05	0.30	0	0	0	8.96	3.69	0	0	Aluminum bronze
9	262.0	46,350	0.135	156,200	Not analyzed									Chrome stainless steel
14	Concrete plates separated by asbestos packing													

tween the two plates (static friction) was first determined; then the machine was started and similar measurements were taken at regular intervals as measured by a counter on the driving eccentric. The number of movements recorded in the test data from which the curves were plotted is twice the number of revolutions indicated by the counter. With most materials the greatest variation in frictional resistance occurred at the beginning of the tests, and readings were therefore taken more frequently during the first 1,000 movements than thereafter.

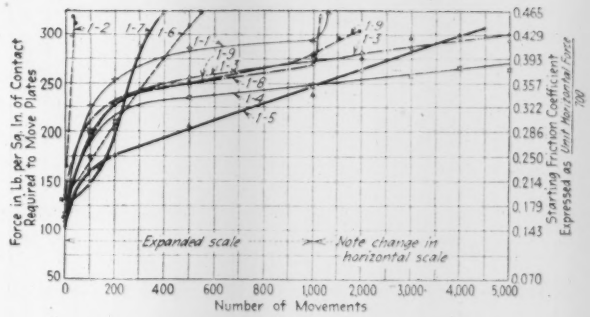
A thermometer set in mercury in a hole in the center of the upper plate indicated a maximum rise above room temperature of 21 deg. F., which was proof that frictional heat as developed during the test would not produce any appreciable change in the characteristics of the materials.

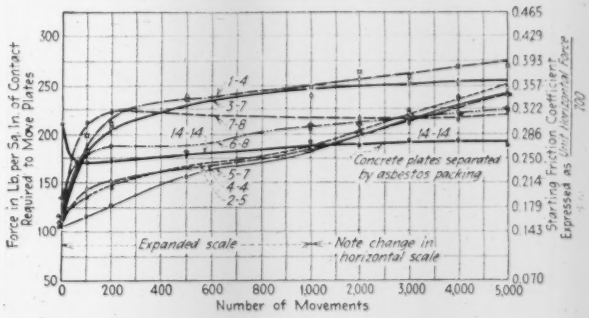
All plates were refinished after each test, and before retesting were carefully cleaned with petroleum ether to remove any contamination resulting from machining or handling. The number of tests made on any combination of plates was governed by the increase in friction resistance that developed during the test; if the combination of plates was unsuitable, only two or three runs were made, whereas if good results were secured, at least four tests were made.

Composition of Material Tested—The tests covered eleven types of bronzes, from a very hard phosphor bronze to a soft bronze containing 25 per cent lead; three types of stainless steel; and concrete blocks separated by tar paper, graphite, axle grease and asbestos sheet packing.

The surface finish of the original set of bronze plates included both polished and ground types. The tests quickly demonstrated that a polished surface is inferior to a ground surface, and subsequent results further indicated that an ordinary, carefully machined surface is at least equal to a ground surface. Therefore after the first few tests the surfaces of all plates were machine finished. Also, it was thought advisable to have the machine marks on the two plates at right angles, but further study will be necessary to determine the importance of this provision.

Test Results—In general, each type of plate was tested without lubrication against itself and then in succession against all of the other metal plates. Fig. 2 illustrates the form of results.



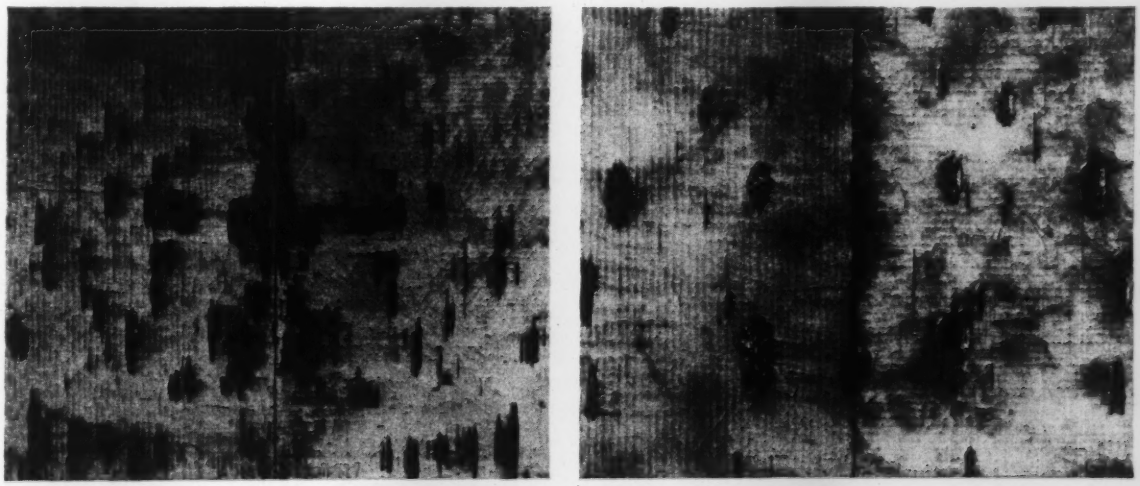


Figs. 2 and 3—Results of bearing plate tests

Above—Hard phosphor bronze tested against itself and against other materials. Below—Seven of the more promising combinations of metal; concrete plates separated by asbestos packing showed best results. Identification numbers refer to table.

Seven of the more promising combinations and the characteristics of their test runs are shown in Fig. 3. This group of tests includes one using concrete blocks separated by a sheet of asbestos packing, which gave very favorable results as to both service and low frictional resistance; at the start its coefficient was higher than that of the metals, but it decreased rapidly after a few movements and then remained practically constant during the life of the packing.

The friction of the concrete blocks, without lubricant,



Figs. 4 and 5—Bronze plates failed with various effects

Left—Phosphor bronze plates (No. 2 on 2) abraded rapidly with pronounced "cold welding" after 148 movements. Right—Copper bronze on copper-lead bronze showed evidence of extreme pitting and "cold welding" after 200 movements. Illustrations show parts of plates at about half reduction.

was beyond the capacity of the machine. Tar paper as a separating medium deteriorated rapidly when subjected to the test under load and quickly lost its lubricating value.

A powder was observed working from between the metal plates on combinations that ran for any length of time. This was especially true of the lead and aluminum bronzes. When this powder formed in excess, it would tend to collect and "cold-weld" to the harder metal in most combinations. The harder bronzes and steels when used with similar hard metals had a tendency to seize each other in more or less small isolated areas, quickly scoring or "welding" together and causing the motor to stop through overload. In such cases the areas between the scored places presented a highly glazed appearance. It is well known that when some metals are rubbed together there is a tendency to seize, in proportion to the intimacy of surface contact.

During the series of tests made with the same metals against each other it quickly became apparent that there was much difference in the resulting action. The three harder bronzes had a tendency to seize or cold-weld, whereas the three softer bronzes (10 to 25 per cent lead), although abrading more readily, did not have as high a coefficient of friction nor did they seize. These softer bronzes, however, chattered considerably and when started by the horizontal jack jumped as much as 0.015 in. when the resistance was overcome.

After testing the plates with ground surfaces as received from the foundry, no means of grinding the surfaces to the same finish for retest being available, it was decided to try a commercial planed finish, using a shaper or planer fitted with a tool having a slightly rounded cutting edge and using a $\frac{1}{8}$-in. feed. This treatment gave surfaces slightly grooved but in a true plane and therefore with a more dependable bearing surface.

The tin bronzes of high copper content (about 86 per cent copper and 14 per cent tin) were particularly unsatisfactory. This type of material when used against itself froze after a few moves. The aluminum bronze, although difficult to cast, showed up very well, and while the coefficient of friction was moderately high from the start with all finishes there was no chatter. There seemed to be no tendency toward freezing, and the friction remained near the first level or dropped off during the test. Stainless steel of the composition tried was a complete failure, freezing together almost at once beyond the capacity of the jack and gage unit.

Conclusions

The tests indicate that:

1. The softer lead bronzes are superior for expansion bearing plates to the harder bronzes.

2. Polished surfaces are inferior to machined surfaces.

3. Asbestos sheet packing is superior to flake graphite as a lubricating medium.

4. Carefully constructed concrete surfaces separated by asbestos sheet packing may render as good service as bronze plates, or even better. However, the friction coefficient of plain concrete surfaces without lubrication is very high and early failure may be expected if the lubricating medium placed during construction deteriorates and fails. The safer procedure is to use bronze plates separated by asbestos sheet packing. Where tar paper is used as a separating medium, unsatisfactory results may be expected.

5. The information secured from the tests has resulted in a change in the California state highway specification for bronze expansion plates, which now reads as follows:

(*a*) *Description*—Bronze expansion plates shall be manufactured in accordance with, and shall in all respects fulfill the physical and chemical requirements of the A.S.T.M. standard specification for bronze bearing metal for turntables and movable railroad bridges, serial designation B 22-21, except as hereinafter modified.

The plates shall have the following chemical composition, conforming substantially to Specification No. 64 of the Society of Automotive Engineers:

	Per Cent		Per Cent
Copper	78.5 to 81.5	Zinc (maximum)	0.75
Tin	9.0 to 11.0	Other impurities (maximum)	0.25
Lead	9.0 to 11.0		
Phosphorus	0.05 to 0.25		

The plates shall be milled to a true plane. If practicable, one plate shall be milled at right angles to the other plate in the set.

The plates shall have a minimum deformation limit in pounds per square inch of 9,000 lb. and a permanent set in 1 in. under 50,000 lb. of 0.1 in. to 0.2 in.

The regular cylindrical test coupon of each heat of bronze shall be submitted to the laboratory for physical and chemical tests.

(*b*) *Placing*—The contractor shall exercise the utmost care to set the plates at right angles to the center line of girders and level in all directions. The plates shall be brought to full bearing at all points.

The two plates in each set shall be separated by a single layer of $\frac{1}{8}$-in. Johns-Manville Asbestos Sheet Packing No. 60, or equal.

Acknowledgment—Officials of the Apex Machine Works and the Enterprise Foundry, both of San Francisto, rendered valuable assistance in advising as to the suitable composition of plates and making the castings. The tests were made by J. L. Hemmert and V. E. Watts, of the laboratory staff, under the direction of the writer. C. E. Andrew, bridge engineer, originally suggested the test series. C. H. Purcell is California state highway engineer.

Bureau of Standards Studies Water Penetration Through Brick Walls

The U. S. Bureau of Standards has been studying the penetration of water into brick masonry. The results show that when the interior walls of brick buildings become wet during a rain it is likely that water has entered through open spaces between brick and mortar rather than directly through these solid materials. Such openings may be produced either by poor workmanship or by shrinkage of mortar. If there are no openings of this sort, the probability of penetration by water through solid 8-in. brick walls is exceedingly remote under normal climatic conditions and if proper precautions in design have been taken. One necessary precaution is to avoid plastering directly on the brick in an 8-in. wall, and this may be accomplished either by furring the wall or by the use of metal ties in place of header brick. The time required for water to travel through a brick, thence through a mortar joint, thence through another brick is far greater than the time taken for water to penetrate the two bricks and the mortar joint when these materials are tested separately and out of contact with one another. Probably one reason for this is the fact that the pores in one material do not communicate directly with those in the other. It is also known that a brick must become highly saturated before it transmits water to another material. This degree of saturation is not attained when the brick is merely wetted through.

Water Softening Plant Employs Pumped Recirculation for Chemical Mixing

Aerator combines actions of cascade and flowing stream—Softened water recarbonated prior to final sedimentation — Filter gages electrically operated

By HARRY N. JENKS
Consulting Engineer, Berkeley, Calif.

RECIRCULATION of part of the flow through the agitation and mixing tanks provides the agitation necessary for efficient chemical mixing and flocculation in the Fort Dodge, Iowa, iron-removal and water-softening plant. Vortex motion induced by the recirculation further assists flocculation in the mixing tanks. Aeration is accomplished by causing the water to flow in a thin sheet over a roughened slab, and the precipitated iron hydroxide coagulates the water successfully. Recarbonation, used in conjunction with lime softening, takes place immediately preceding final sedimentation. In the filter plant the clear-water reservoir abuts directly on the wall of the filters, small dry wells being provided to accommodate the rate controllers. The coagulated water channel and the filter drain are located at the back of the filters. Gages on the filter-operating tables are electrically operated. The new plant is the first complete plant in Iowa for the combined removal of iron and water softening.

The well water supplied to Fort Dodge has an iron content varying from 0.5 to 3.0 p.p.m., has a total hardness of 550 p.p.m. and contains hydrogen sulphide and carbon dioxide in sensible quantities. At present no softening is being undertaken, but operation of the other processes eliminates all of the iron and hydrogen sulphide and effects a 25-p.p.m. reduction in carbon dioxide.

When water softening is undertaken the hardness may be reduced to 100 p.p.m. by lime-soda-ash treatment at a cost for chemicals and recarbonation that will not exceed 4.5c. per 1,000 gal. Based on a population of 27,000, which may be expected in the immediate future, the estimated yearly saving in soap consumption alone amounts to $78,000. Considering only the domestic consumption of soap and fuel and repairs of plumbing, without taking into account the industrial use of water, it has been determined that the net savings to the average householder in Fort Dodge by reason of soft water will be $19 per year.

These estimates are based on the results of studies made with an experimental demonstration plant that was operated for a period of six weeks in order to determine the general feasibility and actual cost of water treatment for Fort Dodge. During its period of operation specific engineering design data were obtained, and the public was afforded the opportunity of determining at first hand the value of a soft iron-free water. Local service clubs held meetings at the plant and were informed as to the operation of the demonstration units. Drinking cups were provided, and pieces of soap and washbasins were on hand for the members of the women's organizations to satisfy themselves as to the value of soft water. The experimental plant, having a capacity of 2 g.p.m., cost $600 and saved probably ten times that amount in the refinements of design and economical arrangement of the treatment-plant units that were predicated on the results of its operation. The processes chosen for use in the Fort Dodge plant were aeration, mechanical agitation, mechanical mixing, sedimentation, recarbonation and filtration.

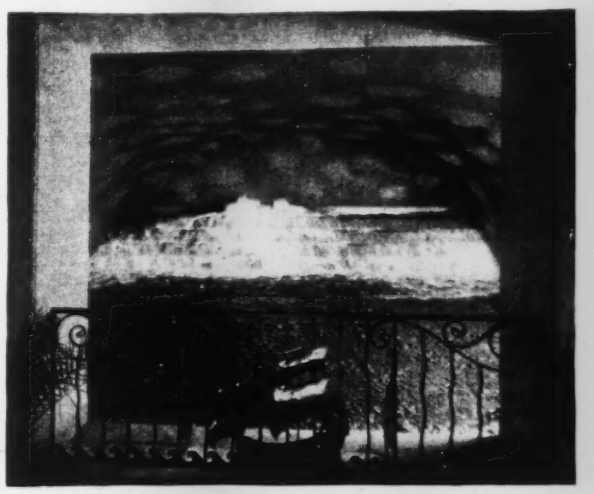


Fig. 1—Spectacle provided by aerator

Combining cascade and streamflow principles, Fort Dodge aerator is built like a cavern to emphasize the scenic effect.

The most striking feature of the waterworks is the aeration chamber that occupies a central location in the main building. A view of the aerator is shown in Fig. 1. The combination of cascade and streamflow aeration, in addition to giving the best results functionally, lent itself admirably to scenic embellishment. In order to take advantage of the aerator as a focal point of interest for the visitor, it was designed in the form of a cavern located on the far side of the entrance lobby, so that its operation could be viewed from this point as through the proscenium of a stage.

The top and side walls of the cavern are of cement mortar thickly laid on heavy metal lath, quite irregular in surface outline and stained to simulate natural rock formation. In the background the incoming water cascades downward to an artificial streambed, strewn with pebbles and small rocks, which effectively riffles the thin sheet of water that flows toward the entrance to the cave and disappears over a ledge into the agitation basin below. The cave may be floodlighted or else allowed to remain in semi-darkness, the effect in either case being interesting to the spectator. When the air lift on the wells is in operation the surges of water over the waterfall produce a reverberation in the cavern that creates

the illusion of the pounding of the surf on an ocean beach. An exhaust fan, concealed above the far end of the cavern, carries away the gases released. The iron found in the supply is precipitated out of solution by aeration alone, and the addition of a coagulating chemical is unnecessary for efficient sedimentation.

After aeration the water passes through the chemical agitation system. This consists essentially of a tank in which the water is retained 10 min. while being subjected to continuous recirculation over a riffled concrete slab partly covering the tank. The softening chemicals, delivered by dry-feed machines, are applied directly to the water in a chemical-feed trough as it flows on to the riffled deck leading to the agitation basin. The water is withdrawn from the bottom of the tank through two recirculation pipes. These pipes communicate with risers in each of which is installed a pump designed for the efficient discharge of a large volume of water against a head not exceeding 1 ft. It is expected that the recirculation ratio, defined as the rate of recirculation pumping divided by the rate of flow through the plant, will have an optimum value exceeding 0.5. As the water is recirculated the flow through the system is taken off from the riser pipes and proceeds to the mixing tanks. The scheme is an adaptation of the streamflow method of agitation described in *Engineering News-Record*, May 24, 1918, p. 808, used for the mechanical aeration of sewage. The flow over the concrete deck is in effect a series of small hydraulic jumps.

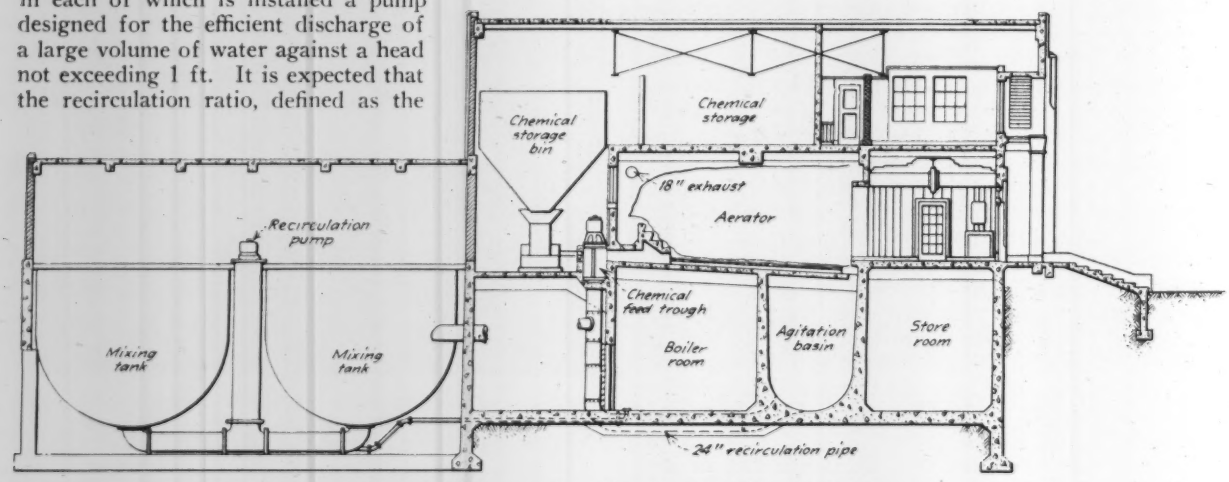


Fig. 2—Mixing system relies on pumped recirculation

Following aeration, part of flow through agitation basin is recirculated by a low-head pump, with softening chemicals added during recirculation. Flocculation takes place in mixing tanks where spiral flow is induced.

Following the relatively violent agitation that accompanies the passage of the water through the agitation basin and over the riffled deck, the water flows through two series-connected mixing tanks, where it is mixed for 20 min. While the main body of the water is progressing through the two tanks and independent recirculation is maintained by a pump installed in the riser tubes between them.

The recirculated water is withdrawn from each tank from the bottom and is discharged tangentially into the tanks near the surface. This induces vortex formation within the tanks and a spiral movement through them along a vertical axis. The mixing action is aided by the thorough overturning of the water resulting from the induced internal mixing currents. This type of mixing unit was developed by the writer for the Fort Dodge plant in an effort to combine the advantages of mechanical stirring with the simplicity of design characteristic of the tanks without paddles used at Kansas City, Providence and St. Louis.

The sedimentation units consist of two 50-ft. square basins equipped with traction sludge scrapers. The two units operate in series. With the thorough chemical coagulation possible, it has been found that a two-hour sedimentation period is satisfactory. This is equivalent to 800 gal. daily per square foot of surface for the average flow through the plant. Experience at Fort Dodge has shown that, for iron removal only, a settling-basin period of one hour is sufficient, without imposing an undue burden on the filters. Sludge can be returned from either settling tank to the mixing unit.

The recarbonation chamber, in the form of a covered box channel, is located between the preliminary and final settling basins and will receive the water following preliminary sedimentation. The carbon dioxide will be introduced in a manner similar to that in which air is diffused through sewage in a spiral-flow aeration tank.

Four filter beds arranged in a single row are built directly abutting on the filtered-water reservoir. By locating the filter influent and drain conduits at the opposite end of the filter compartment, only the washwater piping and the filter effluent lines must be accommodated in the clear well. The main washwater line is supported close to the under side of the filter gallery floor, with the hydraulic cylinders projecting above the floor level. The filter rate controllers and appurtenances are installed

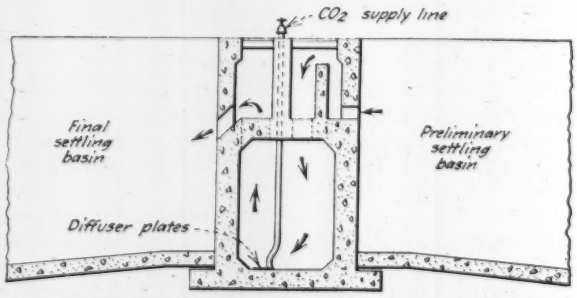


Fig. 3—Carbonation follows preliminary settling

Chamber is in form of closed conduit located between preliminary and final settling basins. Arrows indicate course of water. Entrance ports placed at ends of conduit discharge ports at center.

in dry wells within the filtered-water chamber. The design further allows the substitution of low-head sluice gates for the usual filter-influent and drain valves, effecting a considerable saving in cost of construction.

The loss-of-head and rate-of-wash gages are electrical instruments mounted on the filter-control panel boards. A step toward the use of electrical instruments was made at Sacramento, Calif., some years ago, as reported in *Engineering News-Record*, Aug. 27, 1925, p. 346, but the Fort Dodge installation is the first complete application of this idea that has been made. The filter valves are hydraulic, but the position of each gate is shown by an electrically operated indicator adjacent to the corresponding four-way cock handle.

Washwater is supplied by a centrifugal pump drawing water from the line connecting the clear well and the storage reservoir. A loop in this connecting line is provided for the suction connections of the high-lift pumps. The four high-lift pumps are connected to one side of the loop, and the suction of the washwater pump is connected to the other. This arrangement avoids an unduly high draft on the suction side of the high-lift pumps.

A total loss of head of 3.5 ft. from aerator to filters has been allowed, under the maximum-flow conditions of 6 m.g.d. At this rate the elevation of the water on the filters is such as to permit 5½ ft. depth to be carried on the sand bed. This depth of water enables the filters to operate under positive head for all but a small part of the filter run, as the total head available for filtration is 12 ft.

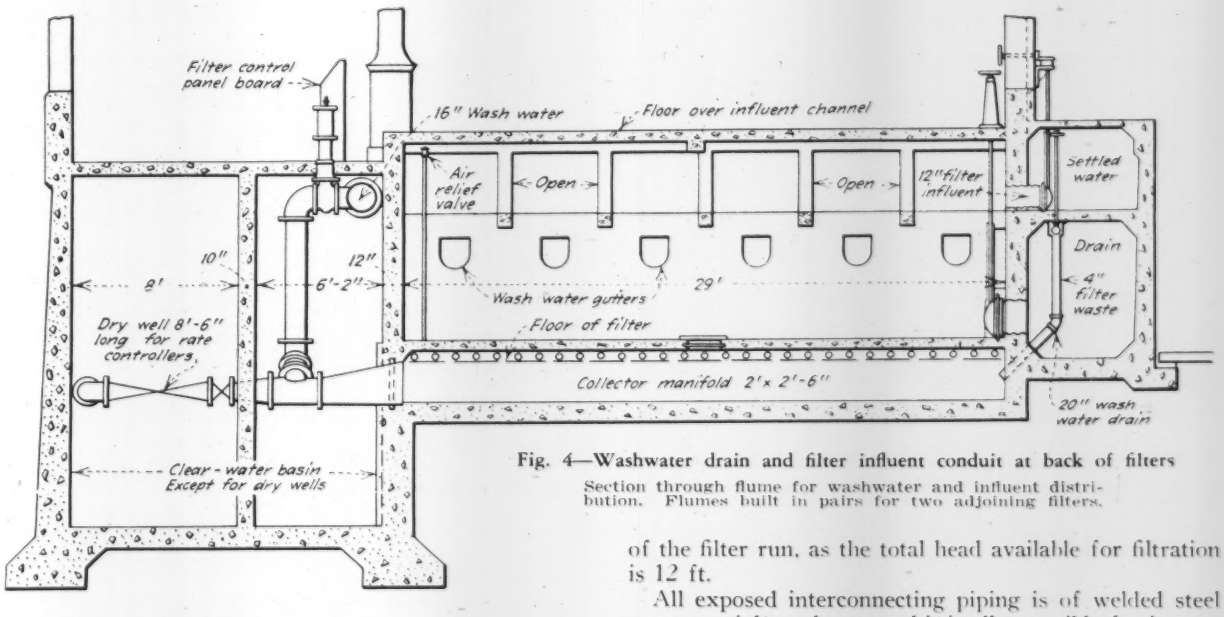


Fig. 4—Washwater drain and filter influent conduit at back of filters

Section through flume for washwater and influent distribution. Flumes built in pairs for two adjoining filters.

A 2-m.g. filtered-water storage reservoir is located on an island in the Des Moines River, 1,200 ft. from the plant. The elevation of the reservoir is such that it can be filled by gravity flow from the filter plant. Similarly, gravity flow from the reservoir back to the high-lift pumps is also secured.

DESIGN CHARACTERISTICS, FORT DODGE IRON-REMOVAL AND WATER-SOFTENING PLANT

Average capacity, m.g.d.	4.0
Maximum rated capacity, m.g.d.	6.0
Hydraulic design capacity, m.g.d.	6.0
Loss of head through treatment plant	
Aerator, ft.	4.75
Agitation tank, Mixing tanks, Sedimentation basins, ft.	3.0
Filters, maximum available loss of head, ft.	12.0
Treatment Units*	
Aerator (Type: cascade, streamflow)	
Aeration surface, sq.ft. per g.p.m.	0.2
Chemical agitation (Type: streamflow)	
Period, min.	10
Recirculation ratio	0.5—1.0
Chemical mixing (Type: spirovortex)	
Period, Min.	20
Recirculation ratio	0.5
Sedimentation (Type: mechanical scraper)	
Period, hours	2
Area, sq.ft. per m.g.d.	1,250
Overflow rate, ft. per hour	4
Recarbonation period, min.	10
Filters	
Rate of filtration, m.g.d. per acre	125
Sand bed	
Depth, in.	30
Effective size, mm.	0.43
Uniformity coefficient	1.4
Gravel bed depth, in.	20

*Detention periods are based on average flow of 4.0 m.g.d.

All exposed interconnecting piping is of welded steel to save weight and cost, and it is all accessible for inspection and painting, inside and out.

The contract price for the present improvement was $143,850. On the basis of 4-m.g.d. capacity the cost of the treatment plant for iron removal alone is approximately $25,000 per million gallons daily, and the corresponding cost for iron removal and water softening combined is $35,000.

The writer served as consulting engineer in charge of investigations and the design of the project. The structural design was made by Harold B. Hammill, and the architectural treatment of the building was the work of Don E. Reinoehl. C. E. Larson, of Fort Dodge, was the general contractor.

Treated Hemlock Ties

Although untreated hemlock ties have a short life of four to eight years, as decay begins soon, especially in moist climate, the Northern Pacific Railway is having good results from creosoted hemlock ties, some of which have been in the track for 21 years, according to a paper read before the Pacific Railway Club by Paul McKay, assistant purchasing agent. These ties cost less than Douglas fir but require a longer period of air seasoning, since they contain a much higher percentage of moisture. The preservative used consists of 80 per cent creosote oil and 20 per cent California fuel oil.

LETTERS TO THE EDITOR

Chamber Will Study Stabilization

Sir—I have just read in your issue of May 7 a rather caustic criticism of the failure of the Chamber of Commerce of the United States to grapple with the problem of business and employment stabilization. It is perfectly true that the Chamber took no active stand on this important problem because of its many complexities and because it realized that only after the most thorough and painstaking study of the causes of the present situation should it make any pronouncement.

The directors of the Chamber recognized that the problem of stabilization of both business and employment is the most important problem facing the capitalistic world today and that something must be done to rectify the present situation or at least to prevent its recurrence. With that in mind the Chamber has appointed a committee to study this problem and report to the directors at the earliest possible date. A list of the names of the members of the committee is attached to this note. There are numerous organizations and foundations that are studying phases of this problem, and it is the object of the committee to co-ordinate its work with research work already being done and to face the problem fairly and squarely despite its many difficulties and complexities.

H. I. HARRIMAN.

Boston, Mass.,
May 14, 1931.

[The committee appointed for the study is headed by Mr. Harriman, chairman of the board of the New England Power Association and president of the Boston Chamber of Commerce, and includes nineteen other leading men of finance and industry. —EDITOR.

Separate Contracts for Steel

Sir—Permit me to compliment you on your editorial "Separate Contracts for Steel" in the May 21 issue, commenting on the enactment of a law in New Jersey requiring separate contracts for structural steel on public buildings. We are in complete agreement with your final conclusion that this law will not make up for any deficiency in backbone on the part of bidders entitled to a fair price for their work, by merely changing the buyer from the general contractor to the public official.

However, price was not, as the editorial infers, the sole or even the most important consideration that caused the steel fabricators of New Jersey to support this bill. Payments by general contractors for work done are in too many instances notoriously unsatisfactory. The easiest source of funds for a general contractor without sufficient funds of his own to finance new work lies in the payments received on account, which rightfully belong to the subcontractors, but which of necessity under the existing order must pass through the general contractor's hands. The irresponsible and unethical contractor does not hesitate to use these funds for his own needs and to let the subcontractor wait. Too often the latter has had to wait until bankruptcy has overtaken his debtor, and collection follows only after months or years of legal actions and delays.

For reasons not necessary to enumerate, probably more irresponsible general contractors are operating in the field of moderate and small-sized public work than in the field of private work. Consequently, a remedy for unsatisfactory payments to subcontractors is more urgently needed on public work such as is covered by this New Jersey law. If this is accomplished, the steel fabricators will feel that their most important objective has been attained and will be well content to take their chances on obtaining a satisfactory price under the conditions of open competitive public bidding.

I would also like to take issue with you on the validity of your analogy between direct bidding by steel fabricators and by cement producers. It is true that in the past few months we have seen much bargaining by public officials in an attempt to drive down the price of cement. To my mind this is due to the coincidence of practically uniform quotations by all bidders, at or near the high level of 1928 and 1929 prices, in the face of large reductions in the prices of most other construction materials, including steel. So far as I am aware, there has been no such uniformity of quotations for fabricated structural steel in a great many years, nor can I see that the passage of this New Jersey law will bring about such uniformity in the future. If I am correct in my understanding of these facts, it will be unnecessary for public officials to resort to bargaining to get the best available price for structural steel, and your analogy will not hold.

JAMES N. KEENAN,
District Engineer,
American Institute of Steel Construction.

New York, N. Y.,
May 26, 1931.

Bridge Approach Planning

Sir—I have just read the editorial in the March 12 issue of *Engineering News-Record*, p. 425, regarding the proposed Yerba Buena Island bridge across San Francisco Bay. I can hardly agree with the statements in this editorial. Prior to Aug. 5, 1930, the council of the city of Berkeley appointed its engineer as a member of the committee of East Bay engineers to make a study of the necessary traffic arteries to connect with the proposed bridge. This committee was functioning prior to the final determination of the location of the bridge. A resolution passed by this committee on Aug. 5 reads as follows:

> *Resolved*, That we proceed to study the necessary connections between the bridge project and existing main streets for the information of our municipalities and for the information of the commission authority; and assuming that route No. 4 is the most practical, our first attention be devoted to the connections with that project and that we endeavor to see that all portions of the East Bay territory are adequately served.

The report of this committee was submitted to the council on March 10, 1931, on which date the council passed a resolution tentatively approving the report. This report was filed with the state highway commission and has received very favorable comment.

A permanent committee consists of the city engineers of Oakland, Emeryville and Berkeley, of which the city engineer of Berkeley is chairman. This committee is in close cooperation with the state highway department.

It is proposed to connect the tunnel road with the eastern bridgehead and also to provide for a highway at least 150 ft. in width extending all the way from Richmond to San José. This highway will be along the bay shore in the vicinity of the bridge.

I am not familiar with the work being done in San Francisco, but I assume that similar studies are being made at that end of the bridge. I shall be glad to furnish you with further information should you desire it.

HARRY GOODRIDGE,
City Engineer and Superintendent of Streets.

Berkeley, Calif.,
May 28, 1931.

Written before the committee of East Bay City engineers rendered their report, our editorial statement was not intended to be critical in tone. Its purpose was to point a warning (equally applicable to San Francisco) against permitting public apathy to prevent an early attack upon the serious problem of arranging for adequate approach arteries. In this respect the point is as pertinent today; engineers and public officials must keep the public actively interested in the matter in order to insure intelligent support of the final plan, particularly when confronted with costs. It is hardly possible that the Toll Bridge Authority will provide all the local approach construction essential to assuring proper benefits from the bridge. The communities themselves, as in other similar cases, must be prepared to add and pay for certain connecting highways, street-widening and straightening projects and grade separations. In all, the project presents a splendid opportunity for San Francisco Bay communities to take some constructive action on a much needed regional plan. —EDITOR.

Bond Issues Approved

Sir—Please refer to p. 941 of *Engineering News-Record* of June 4, 1931, and note heading, "Bond Issues Approved in Kansas." Please be advised that it was the Kansas City in Missouri and not in Kansas that voted the bonds. This in the interest of accuracy.

R. A. LANTZ.

Kansas City, Mo.,
June 17, 1931.

NEWS OF THE WEEK

Ohio Court Reverses Decision in Allen County Bond Case

Reversal of its February decision in the Allen County sewer bond case was announced June 17 by the Ohio supreme court, thus upholding the validity of improvement bonds issued by sewer and water districts and guaranteed by the county. The action is important, inasmuch as the original decision had cast uncertainty upon the validity of millions of dollars of outstanding municipal and county obligations, and had brought to a standstill practically all public improvement work in the state. Now that the constitutionality of district bonds has been established, resumption of this work is expected immediately.

The original action (Bowman vs. Board of County Commissioners of Allen County) was instituted by a holder of certain sewer and water district bonds upon which interest payments had been defaulted due the failure of expected special assessments to meet district obligations. A writ of mandamus was requested to compel the county, which was named as guarantor, to levy a general tax sufficient to pay off the interest then due. This case was lost when the supreme court declared the bonds invalid because the work for which they were issued did not benefit the entire county. This immediately cast serious doubt upon the validity of all outstanding bonds of this type, amounting to more than $200,000,000 in face value, and also destroyed the market for additional bonds about to be issued by a number of other counties and municipalities.

The adverse effect of the decision was so severe that on May 13 the state attorney general intervened, filing a brief requesting a rehearing of the case. This was granted, with the result that the court reversed its decision.

Montana Faces Water Shortage and Studies Conservation

Montana water resources for the 1931 season are considerably below normal and the extreme shortage of snow in the mountains indicates the probability of low runoff records unless summer rains relieve the situation. The irrigation supply to the larger projects and districts will in general be adequate, but on some of the private developments, dependent on direct flow, extensive curtailment of service may be necessary.

As a result of the drought experienced during the last two years and certain indirect effects of conditions in the wheat-raising industry, there has been considerable growth in public interest on matters of water conservation. A special committee has been appointed to study the problem.

Golden Gate Bridge Bids Indicate Cost of About $25,000,000

BIDS for the construction of the Golden Gate Bridge, San Francisco, to be built by the Golden Gate Bridge and Highway District, were opened June 17, and an unofficial tabulation indicates that the total construction cost will be about $25,000,000. This figure is $2,000,000 less than the engineers' estimate made several months ago. A bond issue of $35,000,000 was voted last November to cover the entire cost of this project.

The lowest bidders for the separate contracts are: steel superstructure, McClintic-Marshall Corp., a subsidiary of the Bethlehem Steel Corp., $10,494,000; cables, including fabrication and erection, American Cable Co., $6,255,767; two main piers, Pacific Bridge Corp., Portland, $2,260,000; anchorages, minor piers, cable housings, filling and grading, Barrett & Hilp, San Francisco, $1,645,841; both approach spans, Columbia Steel Corp., $996,000; San Francisco approach road, Barrett & Hilp, $966,180; Marin County approach road, Granfield, Farrar & Carlin, $67,587; paving main span and approaches, Barrett & Hilp, $345,000; electrical work, Progressive Signal & Lighting Co., $133,495; toll houses and buildings,

(Continued on page 1066)

Merced Irrigation District Defaults on Bond Interest

Interest due July 1 on $16,250,000 of Merced Irrigation District (California) bonds will not be paid because of lack of funds. Bondholders were informed June 17 that the $477,000 interest payment could not be met. Realization of the situation some time ago led to the formation of a bondholders' protective committee, which has been investigating affairs of the district, and a report on permanent readjustment is expected shortly.

Conditions of the Oakdale and Nevada districts also are being studied, and plans may soon be completed for adjusting the financial problems of these districts.

City of Albuquerque Levies 1c. Tax on Gasoline

The city commission of Albuquerque, N. M., has passed an ordinance placing an excise tax of 1c. a gallon on all gasoline sold in the city from June 15 to Oct. 15, for funds to enable surfacing the new riverside drive between the Barelas and Old Town bridges. This tax is levied on all gasoline and motor fuel used in the city of Albuquerque, or distributed to retailers whose post office address is Albuquerque. It is hoped to collect about $13,000 through the four-month period during which the tax is levied.

Wide World Photo

PAVING ON HUDSON RIVER BRIDGE NEARS COMPLETION

Corbetta Contracting Corp., contractor on the paving of Hudson River bridge, New York, will complete the laying of the two outside strips of concrete roadway this week. Each roadway is 28 ft. wide. The center strip will be left open until required by increasing traffic. Longitudinal bulb beams 15 in. apart are the main reinforcing of the concrete slab. A construction speed of 240 to 300 ft. of 28-ft. slab per day has been maintained by the contractor, using a single concrete plant. The bridge will be opened to traffic late this year.

Golden Gate Bridge Bids

(Continued from p. 1065)

Barrett & Hilp, $71,430. The bids are now being studied in detail.

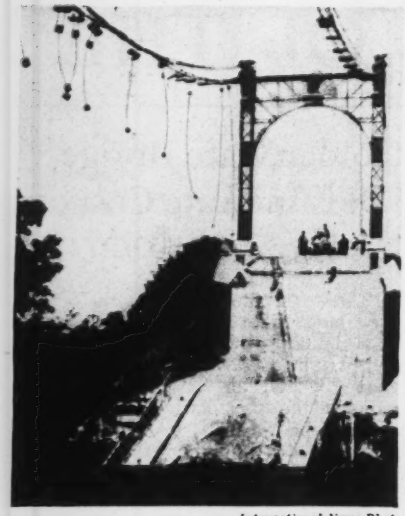
At the same time the board of directors is reviewing geological reports recently submitted on the condition of the south main pier site. This further examination was ordered to confirm the original statements concerning this site. Conflicting geological opinion has resulted from this subsequent study. Two geologists, Prof. Andrew C. Lawson, University of California, and Prof. Allan E. Sedgwick, University of Southern California, have approved the pier site as entirely adequate. A dissenting opinion prepared by R. A. Kinzie, geologist and mining engineer, San Francisco, appointed to make an independent study, declared that "a foundation pier for the proposed Golden Gate Bridge cannot be built on the rock structure underlying the proposed site of the south pier." According to Mr. Kinzie's report, the borings at the site indicate underlying rock of badly crushed and altered serpentine; but it concluded that additional borings west of the proposed site might reveal satisfactory rock for the pier foundation.

The board of consulting engineers has unanimously accepted the majority opinion of the two geologists, and approved the site. Final decision on the foundation is awaiting action of the board of directors of the Golden Gate Bridge and Highway District.

The directors have proposed to offer the first block of bonds totaling $6,000,000 early in July.

BIDS ON GOLDEN GATE BRIDGE

Superstructure (all bids):	
McClintic-Marshall Corp.	$10,494,000
Columbia Steel Corp (U. S. Steel)	10,676,000
Cables, Suspenders and Accessories (28,000 tons) (all bids):	
American Cable Co.	$6,255,767
Columbia Steel Corp.	6,579,000
John A. Roebling Sons Co.	6,844,399
McClintic-Marshall Corp.	7,974,000
Steel Superstructure, San Francisco and Marin Approaches (all bids):	
Columbia Steel Corp.	$996,000
McClintic-Marshall Co.	1,093,400
San Francisco Pier and Fender and Marin Pier (all bids):	
Pacific Bridge Corp., Portland, Ore.	$2,260,000
Siems-Helmers, Inc., San Francisco	2,845,000
Geo. Pollock Co., Sacramento	3,657,866
Anchorages and Approach Span Piers (all bidders):	
Barrett & Hilp, San Francisco	$1,645,841
Geo. Pollock Co., Sacramento	1,746,144
Merritt-Chapman & Scott, San Pedro	1,864,991
Siems-Helmers, Inc., San Francisco	2,048,854
Healy-Tibbitts Construction Co., San Francisco	2,125,914
G. F. Atkinson Co., San Francisco	2,275,949
Porter Bros. Corp., Detroit	2,972,930
Presidio Approach Road (2 low bidders):	
Barrett & Hilp	*$966,180
Lindgren & Swinerton, Inc., San Francisco	*982,373
*With certain additions and deductions.	
Sausalito Approach Road (2 low bidders):	
Granfield, Farrar & Carlin, San Francisco	$67,587
F. C. Cuffe, San Rafael	76,100
Pave Main Bridge and Approach Spans (7-In. Concrete): (all bids)	
Barrett & Hilp	$345,000
Monson Bros., San Francisco	444,900
Healy-Tibbitts Const. Co., San Francisco	496,000
Electrical Work (2 low bidders):	
Progressive Signal & Lighting Co., Ltd.	$133,495
Alta Electric Co., San Francisco	142,460
Toll Houses and Service Buildings (only bidders):	
Barrett & Hilp	$71,430
Portland Cement (bids based on 100,000 bbl.) (all bids):	
Santa Cruz Portland Cement Co., Pacific Portland Cement Co., Henry Cowell Lime & Cement Co., Yosemite Portland Cement Co., and Calaveras Portland Cement Co., all of San Francisco, bid $2.44 per bbl.; 10c. deduction for sacks returned.	



International News Photo

COLLAPSED SUSPENSION BRIDGE IN FRANCE

This first view of the wrecked Isle River bridge near Bordeaux corroborates the belief expressed in our issue of June 11 that the bridge was of the intersecting cable or Fidler-truss type. Four separate cables are shown over each tower leg, arranged in an upper and a lower pair, the upper pair in one half of the span becoming the lower pair in the other half of the span. The compression posts or struts that held the pairs of cables apart and with the diagonal tension members formed the web system of the truss are not visible. Steep backstays may be seen in the original photograph. The forged-steel rod suspenders that carried the concrete deck are shown dangling from the cable. The dark spots along the center line of the sidewalks are apparently the castings to which the suspenders connected. It is said that failure of the bridge was initiated by a truck colliding with and breaking off one or more of the suspenders, the remaining suspenders ripping off as the load on them was progressively increased.

Hoover Dam Notes

Progress on the Hoover Dam project for the week ended June 17 included the following:

Delivery of power over the Victorville-Riverside transmission line of the Southern Sierras Power Co. is scheduled to begin June 27.

A draft of specifications was completed for drilling across contraction joints in the Gibson Dam. The purpose of this drilling is to determine the effectiveness of the grouting. The same grouting system is to be used at Hoover Dam.

Final designs were commenced for the concrete plugs in the outer diversion tunnels. Studies were begun to determine the feasibility of changing the intake ends of the outlet works from towers to tunnels in the canyon walls. The inlets are to be controlled by slide gates operated hydraulically.

The adit in the Arizona abutment has reached a depth of 433 ft. In the Nevada abutment the adit is in 282 ft. A 12x12-ft. pioneer tunnel has been started along the line of the inner diversion tunnel on the Arizona side. Work on the excavation of Arizona tunnel No. 3 was stopped pending a probable change in its location.

Applications for sites in Boulder City now total 66, of which 28 lots are to be used for business purposes. A total of 11,400 ft. of pipe for the water system has been laid. All trench excavation has been completed. Failure to receive certain fittings has resulted in some delay on the work. The excavation of the incline at the presedimentation basin is complete. Excavation for pump house No. 1 has been finished.

Two trestles on the Boulder City-Hoover Dam railroad are complete and the substructure for a third trestle is ready. Tunnel No. 2 is nearly completed. Tunnel No. 3 is in 350 ft. with its top heading and 300 ft. with its full bore. The full bore has started on tunnel No. 4. No work has been done as yet on tunnel No. 5. Surfacing has been applied to 9,500 ft. of the Boulder City-Hoover Dam highway.

Roy W. Carlson, for four years testing engineer for the Los Angeles County Flood Control District, has been appointed research engineer by the U. S. Bureau of Reclamation to conduct the studies on Hoover Dam concrete problems which will be made at the University of California under the direction of Prof. R. E. Davis.

Concrete Board's Report

Data compiled for the use of the board of consulting engineers on concrete problems at Hoover Dam fill more than 1,000 typewritten pages. This material includes reports by B. W. Steele and Arthur Ruettgers, of the bureau's engineering staff, on opening of contraction joints due to the cooling of concrete and on the strength and permeability of mass concrete.

J. H. Warner, another engineer on the bureau's staff, reports on mixing and manufacturing problems. L. H. Tuthill, a concrete technologist, covers the use of Fresno pumecite as a comixture with portland cement. Burton Lowther, a consulting engineer, reports on tests to determine the possibilities of reducing the setting heat by controlling the chemical and physical properties of the cement. D. C. Henny, serving also as a consulting engineer, reviews and reports on methods of thermal control of concrete, as does Dr. W. F. Durand.

"Dissipation of Setting Heat in Hoover Dam" is the title of a report by Ivan E. Houk, one of the bureau's senior engineers. R. E. Glover, of the bureau's engineering staff, and F. C. Carstarphen, a consulting engineerfi report on "Calculations to Check Temperature Set-ups and Thermal Stresses in Dams." Mr. Glover has a separate report on "Cooling Studies." E. N. Vidal has translated a report by Albert Renaud, a French engineer, on "Shrinkage in Large Concrete Dams."

Text of War Department Refusal to Application for New Hudson River Bridge

THE official notification received by the North River Bridge Co. from the Secretary of War regarding refusal of its application for permission to build a combined highway and railway bridge over the Hudson River at 57th St., Manhattan, is presented below. No additional data supporting or bearing upon the opinions expressed in the letter accompanied the notification. The letter, dated June 9, 1931, follows:

The President, North River Bridge Co.,
26 Exchange Place,
Jersey City, N. J.

My dear Sir—I am writing to you in reference to the application of your company to build a bridge over North River at 57th St., New York City.

This application, as you know, was passed upon by my predecessor in office, and the conditions under which the bridge might be built were set forth by him in some detail. These conditions were unsatisfactory to you and you applied to me about a year ago to have those conditions reviewed by me under the circumstances then existing. The review has been made with great care by my legally constituted assistants and they have rendered their report and recommendations.

Before entering into the details of the case I would assure you that it is my earnest desire to see the great piece of constructive work, which you have so ably sponsored through many years and which you are so eminently qualified to carry to a successful conclusion, inaugurated now and vigorously prosecuted. The present conditions are such as to welcome this work from all standpoints.

In response to your previous application, requirements were set by this department which you considered to be prohibitive to building the bridge at the locality which you have selected, when engineering and economic questions are answered. Your location is a good one in that it is just about the middle of the Island of Manhattan and will serve its purpose well. But unfortunately it is so close to where great ships dock that it, if clearances are insufficient, will be a bar to their maneuver into dock under some conditions. There are ships in operation in the harbor now which cannot maneuver under your proposed bridge without alteration in them more serious than the mere lowering of masts. The history of the increase in size of ships indicates that the past should not be entirely foregotten and the future wholly discounted. Whether we do that or not, we cannot ignore the present. The conditions are such that, with the bridge in its location as selected by you, it must have clearances sufficient to pass existing ships without serious modification in them; and with some regard for the future these clearances must allow something in the nature of leeway. The history of bridge construction in New York clearly indicates the wisdom of the requirement.

I call your attention to the importance of New York, now the world's greatest port. It is not one of local importance only, but is vitally important to the whole of the United States. It is used by the ships of all nations. To limit its capacity seriously at a critical point is action that cannot be considered seriously.

Bridges sponsored by private interests should have the unqualified indorsement of properly constituted local authority. Our hearings do not indicate that such indorsement exists on your proposition, but the contrary. The objection of navigation interests are not in any case to be taken as wholly conclusive. Their approval might well be so taken. Navigation interests seriously object to your proposal.

The great commercial bodies may be safely trusted as having the prosperity of the community at heart. I find that your proposition is not approved by some who have a view that is not purely local.

The decision of my predecessor in office as to clearances was for not less than 200 ft. vertical clearance at mean high water at midchannel and 185 ft. at pierhead line; and horizontal clearance from pierhead line to pierhead line. I still believe that those provisions would be most satisfactory. It is not believed to be of much value to reduce those figures by amounts that I consider to be trifling. They must be adhered to consistently and substantially in the location that you propose.

You are at liberty to choose a new location. In that event you will be given full and attentive hearing. Respectfully,

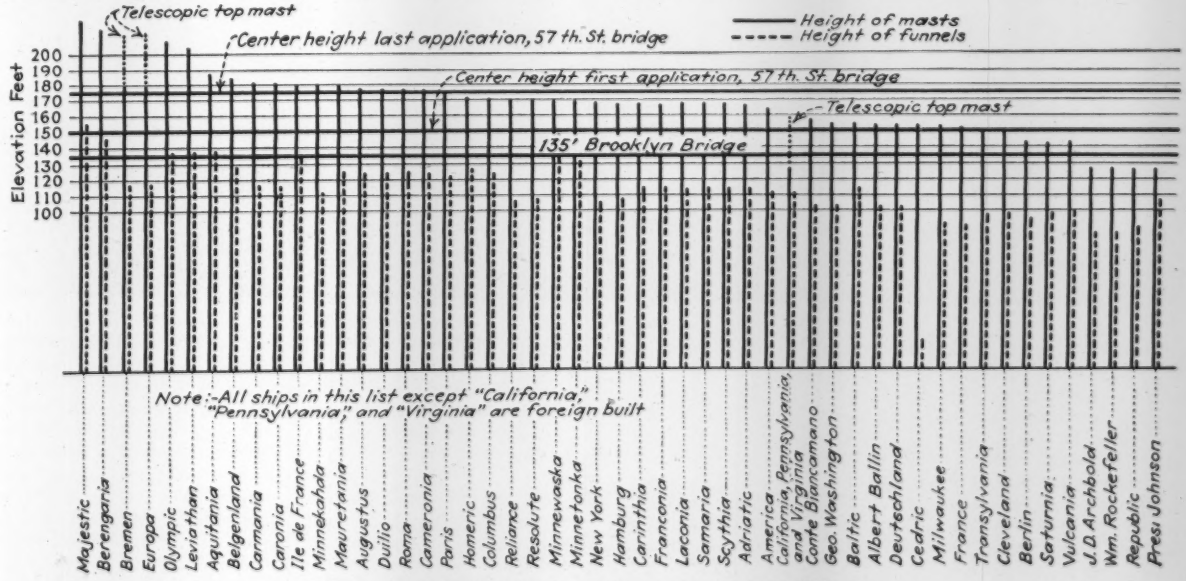
PATRICK J. HURLEY,
Secretary of War.

* * *

In view of Secretary Hurley's statement that "there are ships in operation in the harbor now which cannot maneuver under your proposed bridge without alterations in them more serious than the mere lowering of the masts," the accompanying chart of mast and funnel heights of ships entering the port of New York is of interest. From this chart it is not clear to what ships reference is made, for none has a funnel height of near 175 ft. Only one has a funnel height of over 150 ft., the clearance of the proposed bridge at the pierhead lines.

Definite Action Needed on Bridge Clearances, Says Grunsky

Definite action by the International Congress of Navigation at its next meeting on the subject of limitation of vertical clearance of seagoing ships is urged by C. E. Grunsky, of San Francisco, president of the American Engineering Council. In a communication to M. J. Millecam, of Brussels, general secretary of the Permanent Association of Navigation Congresses, Mr. Grunsky points out that the action of the twelfth Inter-



Mast and funnel heights of vessels entering New York harbor

It is important to note that the two most recently built ships, the "Europa" and the "Bremen," indicate a trend toward lower funnels and telescoping masts. The proposed new Cunard liner will have a 130-ft. funnel height, also lower than other existing ships of comparable size.

national Congress in 1912 defeating resolutions urging such limitation should be reversed.

Stating that the size of seagoing ships is closely associated with the height of bridges, Mr. Grunsky declares that what is needed at the earliest possible moment is a declaration by some international organization, such as the Permanent International Association of Navigation Congresses, that some vertical clearance would fulfill every reasonable requirement, as, for example, about 175 ft.

"To this vertical clearance," he says, "any vessel of whatever type or of whatever size can adjust its top works. It seems obvious that no ship, no matter how large, need have funnels which, when the ship is light, will have its top at a greater height than 160 ft. above the water. It is obvious too that where, at the whim of an owner or of a marine architect, masts are wanted which go to a greater height than about 160 ft., these masts can be so arranged that their top sections can be lowered."

300-Mile Pipe Line Completed and Put Into Operation

The new 12-in. pipe line of the Western Gas Co., from El Paso to Douglas and Bisbee, Ariz., and Cananea, Sonora, Mexico, was put into service June 8. Construction of this 300-mile pipe line was started in February and completed the latter part of May, two months ahead of the contracted construction schedule. The completed line was successfully tested by the 24-hour pressure drop method at 750 lb. per sq.in. The line will be operated under a pressure varying from 300 to 600 lb. per sq.in. The construction of the line cost $6,000,000.

The Bechtel-Kaiser Co., Ltd., San Francisco, was the general contractor on the main line construction, with C. P. Bedford project manager on the job and Edgar F. Kaiser assistant manager. Ford, Bacon & Davis, New York, were designing engineers and supervised main line construction; Stone & Webster supervised engineering of compressor stations and main line construction.

Seattle Considers Developments on Skagit River

The city council of Seattle, Wash., has under consideration a resolution providing for the sale of an additional $2,000,000 worth of city light bonds to finance purchases and construction connected with developments on the Skagit River and at Seattle power stations. The bond sale was requested by W. Chester Morse, superintendent of city light. Mr. Morse advised the council that expenditures for city light, mostly for new machinery, and work on the new Diablo power house would total $3,755,000 by Dec. 1.

Six-Day Institute in City and County Planning

A six-day institute in city and county planning was one of the principal features of the fourth annual short course in public administration conducted June 8 to 13 at the University of Southern California, Los Angeles. The attendance for this section of the course averaged 55 at each session and included municipal planning engineers, architects and members of planning commissions.

L. Deming Tilton, director of planning, Santa Barbara County; Gordon Whitnall, of Los Angeles, counselor to cities, and Charles Diggs, director, regional planning commission, Los Angeles County, conducted the six-day sessions. Lectures, papers and round-table discussions dealing with economics of city planning, social aspects of city planning, planning commissions, organization of departmental activities and administrative problems comprised the course of study. A committee representing cities and towns of the Pacific Southwest cooperated with Prof. Emery E. Olson, director of the school of public administration, University of Southern California, in arranging the educational sessions.

The Association of City Planners of Los Angeles County and members of the City and County Engineers' Association held special meetings at the university during the last days of the institute.

GREAT FLOOD PASSES RUSSIAN DAM WITHOUT DAMAGE TO THE PARTLY COMPLETED STRUCTURE

What is believed to be the greatest flood every handled during the construction of a dam was passed through openings left in the spillway of the Dnieper dam in Russia during a flood which occurred in May. On May 14 the flow of the river reached a peak of 835,000 sec.-ft. The accompanying photograph was taken at that time. Thirty-seven openings 43 ft. wide were left in the dam to pass floodwater during construction.

The foundations in some places are 80 ft. below the floodwater surfaces just below the dam. Ultimately the water level behind the dam will be 125 ft. above normal water in the river.

The cofferdam work required for the width of the river, which is about 3,000 ft., was divided into three sections: left bank, one-third; right bank, one-third, and middle, one-third closure. The cofferdams were of timber construction and founded on boulder overburden. When the flood occurred, all need of the cofferdams for the construction of the dam had passed, so that no damage was caused by the flood to any of the construction or permanent works of this development.

The work of filling in the spillway sections between the piers will require the unwatering of the present discharge openings by means of special closure gates and the depositing of the concrete with the overhead cranes shown in the photograph. The three-stage lock system occupies the left bank of the river and the power house and its nine turbine units of 77,500-kva. capacity occupy the right bank.

The work at the Dnieper project is being carried on under the direction of Hugh L. Cooper, consulting engineer, New York.

Uniform Accounting for Chicago Contractors Proposed

Following the exposé by U. S. District Attorney G. E. Q. Johnson of a number of cases involving apparently excessive profits to contractors in Chicago, Alderman John A. Massen on June 10 introduced an ordinance in city council granting authority to the city comptroller to prescribe a uniform system of accounting for all contractors doing work for the city involving an expense in excess of $500. Under the provisions of the ordinance contractors must maintain an office in the city, keep books, records, canceled checks and vouchers and file with the comptroller duplicate copies of books, records and accounts. The records so kept are to show in detail receipts and disbursements and be kept intact for five years in such place as the comptroller may determine.

The comptroller is to prescribe the form of the records, which are to be uniform for all similar contracts, and he has the privilege to change the forms or system of records at any time. The records are to be made a public record admissible in evidence of the facts, figures and transactions which they purport to reflect. For violation the contractor may not receive payments or if already paid the city may recover the sums so paid. Only surety bonds recognizing the uniform accounting procedure are to be accepted.

Alderman Massen states that this is not a new legal requirement inasmuch as utilities furnishing service to municipalities and the railroads furnishing service to the public have long been required to keep uniform accounts and make them public. Furthermore, he states, the honest contractor, making a reasonable profit of 10 to 20 per cent, has nothing to fear and should welcome the innovation.

Says Boulder Dam Power Is Too Costly for Dan Diego

That Boulder Dam power will prove too costly for the city of San Diego is the statement made in a letter written by W. F. Raber, vice-president and general manager of the San Diego Consolidated Gas & Electric Co., addressed to Mayor Walter W. Austin, of San Diego. Mr. Raber advised the mayor that electrical energy could be generated locally by steam more economically, even should the government reduce its estimated charges 50 per cent. He agreed with Nelson Eckart, of the engineering department of the city of San Francisco, that the cost of Boulder Dam power to the city of San Diego is prohibitive. The letter was in the nature of a refusal to act as an agent in bringing in Boulder Dam energy.

The Metropolitan Water District of Southern California had previously been approached by the San Diego city officials with a similar request, which was refused on the ground that the district cannot guarantee delivery.

WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

Attempt to Be Made to Extend Bacon-Davis Law to Apply to Federal Aid Highway Work

EXTENSION of the Bacon-Davis prevailing wage law so as to make it apply to federal aid highway work will be attempted next session, according to the announced plan of several members of Congress, who have been aroused over protests that labor prices are being beaten down on federal road work. In its present form the bill applies only to the construction of government buildings.

While desirous of according every protection and advantage to labor, the Bureau of Public Roads has indicated that it would be opposed to legislation that would complicate the functioning of the federal aid system. Highway work differs radically from work in the building trades. Of basic importance in this connection is the fact that the federal government is not directly involved in contracts for federal aid highway work. It is expressly stated in the amended federal aid act that the construction work and labor in each state shall be done in accordance with state laws and under the direct supervision of the state highway department.

The point also has been raised that in road work or any other type of construction work in the field it would be virtually impossible to determine the community in which the work was being done. Thus serious difficulties would arise in determining the wage scale that would apply. Another factor that would operate to discourage the fixing of wage rates on highway work is the factor of mechanical equipment. It has been pointed out by officials of the Bureau of Public Roads that the amount of equipment used varies according to the labor rates. The contention is, therefore, that any system that tends to destroy the flexibility of wage rates would bring about a more complete mechanization for roadbuilding operations.

Although a number of complaints have been received as to the wages paid on certain building work for the federal government, labor department officials state that the secretary of labor has not yet been called upon to take a hand in the situation. In every dispute that has arisen so far it has been found that the matter can be adjusted by the contracting officer of the department doing the work or by a direct agreement between the contractor and labor elements so as to preclude the necessity of submitting an appeal to the secretary.

Federal Gasoline Tax Opposed

Practically every member of Congress who could be reached for an expression of opinion is opposed to Secretary Mellon's proposal for a federal tax on gasoline. The general feeling is that this particular tax has been preempted by the states and constitutes the only practicable way in which the states can raise money for highway work. The states feel that they have handled the gasoline tax in a forward-looking manner. More than 95 per cent of all money collected in that way by the states has been used in the construction of highways. Only four states have deviated from the principle that all gasoline tax money should be expended for highway construction. In those states part of such revenue is used to support schools.

Cle Elum Dam Bids to Be Opened July 10

Bids will be opened on July 10 in Washington, D. C., by the U. S. Bureau of Reclamation for construction of the Cle Elum dam, located 8 miles from Cle Elum, Wash., and estimated to cost $5,000,000. J. S. Moore, Cle Elum, is superintendent in charge. The work will be divided into two parts, schedule 1 including the plans for the dam itself and schedule 2 providing for clearing of 2,700 acres of land for the site of the project.

The principal items involved are as follows: 134,000 cu.yd. of stripping, 22,500 cu.yd. of tunnel and shaft excavating, 1,552,000 cu.yd. of excavation in open cut, 35,000 cu.yd. of back fill, 1,220,000 cu.yd. of earth and gravel embankment, 44,000 cu.yd. of riprap and paving, 11,200 cu.yd. of concrete in tunnel and shaft lining, 20,900 cu.yd. of concrete other than tunnel and shaft lining, 20,000 cu.ft. of pressure grouting, placing 3,390,000 lb. of reinforcement bars, placing 3,800 lin.ft. of 6- to 30-in. drainpipe, driving 12,860 lin.ft. of sheetpiling, installing 575,000 lb. of metal work.

The call for bids does not include purchase of materials, which will be furnished by the government.

Steel Bearing Piles Used for California Highway Bridge

Contract for constructing a 21-span plate girder bridge to rest on 630 steel bearing piles has been awarded to the Mittry Bros. Construction Co., Los Angeles, by the California division of highways. This bridge across Santa Clara River will be 1,806 ft. long and consist of 86-ft. plate girder spans on concrete piers. The piers will rest on 8-in. H-section steel bearing piles aggregating 19,100 lin.ft. Contract price for this work was $0.86 per foot for the piles and $15.25 each for driving. The total contract price for the structure was $282,303.

This is the largest bridge designed for this type of foundation by the state highway bridge department under Charles E. Andrew, bridge engineer. A smaller bridge and a 1,380-ft. viaduct are being built with steel pile foundation, but in these cases the superstructure is carried directly on the piles.

George S. Bartlett Joins Staff of Portland Cement Association

Appointment of George S. Bartlett, of Chicago, as assistant to the chairman of the board of the Portland Cement Association, announced in our news columns of May 28, marks the transfer of activity of one of the most notable figures in the highway field. Mr. Bartlett has been intimately identified with the good-roads movement for twenty years, and is one of the pioneers in securing the introduction of concrete for highway and street paving.

He entered the cement business in 1884 as secretary of the Milwaukee Cement Co., manufacturer of natural cement; from 1904 to 1907 he was head of the Western Portland Cement Co., of Yankton, S. D., and later engaged in sales work for the Marquette Cement Manufacturing Co., of Chicago. In 1910 Mr. Bartlett entered the employ of the Universal Portland Cement Co. His work was largely that of making contacts and improving relations with the trade, but beyond these duties he soon became known as a disciple of highway development. Except for a period of three years, during which he was vice-president of the Edison Portland Cement Co., he remained with the Universal Atlas Co. until his recent retirement from the organization under the operation of the 70-year retirement rule of the United States Steel Corp.

One of his friends, who has followed his career for many years, pays him the following tribute:

George Bartlett has made an unusual place for himself in highway affairs. For twenty years he has been going up and down the country helping wherever he could—helping highway causes and highway men. A bond issue here, a new highway law there, had his help. The troubles of a commissioner, an engineer, a contractor, he made his own. He counseled, and inspired with his hopefulness and never-say-die spirit.

His primary job was to promote the use of cement, his own particularly, yet his competitors in cement and in other materials freely recognize that he has created business for them as well as for his own product. His method was to build demand for good roads and sound administration. He felt that his product was so good that its generous use was inevitable in a soundly conceived, soundly administered highway program. Not that he lost sight for an instant of his main objective, promoting his product, but he seemed to feel that he could get farther by selling the American public the idea of roads. Then they would use what he wanted to sell.

Now he transfers his hat to a new organization, but his work will not be essentially different. Through the Portland Cement Association his vigorous personality may be given even wider scope. Other fields than roads may learn to acclaim his friendliness, his helpful spirit.

Irving Porter Church

A Notable Educational Career Sketched by a Pupil and Associate

News of the death on May 7 of Irving Porter Church, professor emeritus of civil engineering at Cornell University, was received with regret by Cornell men everywhere, especially by those who as undergraduates came under his influence. An outstanding figure in engineering in this country, his death leaves a void difficult to fill. The following extracts from a biographical sketch written by S. G. George, professor of mechanical engineering, Cornell University, printed in the Novem-

Irving Porter Church

ber, 1929 issue of the *Cornell Civil Engineer*, give a graphic picture:

The figure of a man, small in stature, deep in concentrated thought, apparently burdened by a black bag filled almost to bursting—a bag so affected by the force of gravity as to affect in turn the equilibrium of its bearer—needs no further description to Cornell engineers of the period ending in 1916. Irving Porter Church carried that bag and its predecessors over miles of campus paths. . . .

It is fairly evident that the state of the art, the science, the practice of engineering at the time Prof. Church and his early colleagues began their work in teaching at Cornell and elsewhere about the country was in its beginning. Few established curricula had been tested by use. The methods of presentation had to be developed. A prophetic outlook into the future of engineering and the coming changes in industry was necessary. The success with which these early pioneers solved the problems of engineering education is proved in several ways. The graduates who passed under their instruction grew to be leaders in many fields of work. The course of training instituted by these young professors resulted in enlarging the powers of their students so that these powers grew with use and their owners met entirely new problems with confidence and with eagerness. They were marked men in any community. In educational lines, the graduates who entered the field of teaching, basing their methods upon those by which they had been trained, set a high and improving standard, spreading better instruction far and wide over the country.

We know there must have been discouraging difficulties. The buildings and equipment were entirely inadequate. Financial support for salaries and expenses was lacking. Of heat and light there was little; of mud a plenty. For texts and instructions used in the various courses, provision had to be made in many subjects and with the greatest promptness. To all these activities Prof. Church devoted an amount of time and energy little appreciated by our present students. Facing the difficulties, he showed a courage and persistence which we find in very few men.

He was peculiarly gifted with the ability to see relations in logical order. His presentation of a theory and his mastery of direct and lucid solutions of problems showed the work of a genius. All of these qualities appear in the products of his pen, pencil, chalk, typewriter and of his well-known mimeograph. . . . It is impossible for the writer to list the numerous articles on subjects connected with engineering which were the product of his ready pen. . . . It is not to be denied that the reputation of Cornell was greatly increased by the excellence of all the widely published books and articles which Prof. Church produced. . . . Each had a message. Each taught something. Each clarified an obscure point or theory.

Port of Seattle Begins Large Waterfront Development

The Port of Seattle Commissioners have purchased a large site on the waterfront on Railroad Ave. at Charles St., which will be combined with the Skinner & Eddy shipyard site, owned by the port, in the first step of a waterfront development program eventually costing $2,000,000. The new site is 134 ft. wide and 1,200 ft. deep and cost $125,000. Construction on the first unit of the proposed terminals will begin at once, providing a pier and transit shed 600 ft. long, costing between $400,000 and $500,000. George F. Cotterill is port commissioner.

First Unit Completed at Lindbergh Field

The first field unit of Lindbergh Field, San Diego, Calif., has been completed and is now being fenced. This unit, 142 acres in area, was largely reclaimed from San Diego Bay tidelands by filling and grading, requiring the dredging of 2,389,018 cu.yd. of earth from the bay. The area is surfaced with decomposed granite and a complete drainage system has been installed. An additional 122 acres is now being reclaimed by dredging, which will provide a turning basin 3,600 ft. in diameter and 36 ft. deep adjacent to the field for the use of the navy aircraft carriers.

The Boeing company has completed a $30,000 hangar on this airport.

A zoning ordinance recently passed by the city of San Diego limits the height of buildings around Lindbergh Field and throughout the city so that no building may be erected that would intercept a slope of 8 deg. 7 min. originating at the boundary line of the field.

Bids Asked for Madden Dam, Panama Canal Zone

Invitations have been sent out to contractors, through the purchasing department of the Panama Canal, to submit bids for furnishing labor and materials and performing all work for the construction of the Madden Dam and power plant. Specifications will be ready, it is announced, about July 1 and bids will be received until Sept. 1. Congress has set a cost limit of $15,500,000 for the project.

The principal items of work and the estimated quantities involved are as follows: 685,000 cu.yd. of all classes of excavation; 646,000 cu.yd. of earth and rock fills in embankments; 518,000 cu.yd. of concrete; 38,000 cu.ft. of grout; drilling 35,000 lin.ft. of grout holes; placing 3,800,000 lb. of reinforcement bars; installing 79,719,000 lb. of small metal pipe and fittings; installing 705,000 lb. of large metal conduits; installing 1,487,000 lb. of structural steel; and installing 6,700,000 lb. of gates, hoists and other metal work.

The invitation for bids does not cover the purchase of materials which are to be furnished by the government.

Performance of the work is to begin within 30 calendar days after date of receipt by the contractor of notice to proceed and shall be completed within 1,350 calendar days from the date of receipt of such notice.

Official and Real Wages in California

The accompanying tabulation shows official and actual wages of building trade mechanics in three California cities. The scale is being maintained in both Sacramento and Los Angeles as far as the larger contracting organizations are concerned. In Sacramento there is an agreement that maintains wages until June, 1932, but reports persist that individual workers are accepting less than the scale. Following are the rates for some trades in addition to those tabulated: Concrete workers, 87.9c.; cement finishers, $1.12½; hodcarriers for plasterers, $1.12½; for bricklayers, $1; roofers and painters, $1.12½.

On smaller jobs in Los Angeles two-thirds the official rate is paid and local labor organizations are endeavoring to correct this. Carpenters on finished work are paid $1, on rough work 87½c. Cement finishers receive $1.12½ and concrete workers 62½c.

In San Diego wages are down two-thirds to one-half, as shown in the table. For common labor the city pays 62½c., and all other employers 40c. to 50c. Union wages are paid only on government work.

	Official and Actual			San Diego
	Sacramento	Los Angeles	Official	Actual
Carpenters	$1.12½	$1.00	$1.00	$0.75 @0.87½
Bricklayers	1.50	1.37½	1.50	0.75
Plasterers	1.50	...	1.50	0.75
Ironworkers	1.37½	1.12½	1.12	0.80@0.90
Common	0.68¾	0.50	0.62½	0.40@0.62½

COSTS AND CONTRACTS

ENR Index Numbers

Cost			Volume	
June 1, 1931	187.23	May, 1931		251
May 1, 1931	189.33	April, 1931		289
June 1, 1930	203.36	May, 1930		354
Average, 1930	202.85	Average, 1930		260
Average, 1929	207.02	Average, 1929		317
1913	100.00	1913		100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of June 25, with some comparisons, total as follows:

(In Thousands of Dollars)

	June 25, 1931	Average of Last Four Weeks 1931	1930
Buildings:			
Industrial	$1,282	$2,510	$7,342
Other	10,467	13,700	29,800
Streets and roads	17,790	15,635	17,707
Other eng. constr.	6,729	15,104	20,694
Total	$36,268	$46,950	$75,545
Total, all classes, Jan. 1 to June 25:			
1931			$1,385,622
1930			1,850,823

State Highway Pavement Mileage Gains in 1931

A distinct gain in mileage of pavements and surfaces for state highways as contrasted with earth and untreated roads is shown in the 1931 estimates of mileage constructed as compiled by the statistical department of the American Road Builders' Association.

A comparison of 1931 estimates with 1930 figures for mileage of various types of state highways shows: graded roads, 10,249 in 1931 and 11,148 in 1930; treated and untreated sand-clay, gravel and macadam, 18,426 in 1931 and 17,203 in 1930; asphalt, concrete and brick, 11,735 in 1931 and 11,133 in 1930. The total mileage estimated for 1931 is 40,410, compared with 39,484 in 1930. Contracts awarded for the first three months of 1931 were $181,637,138 for state highway work, compared with $114,101,383 for the same period in 1930.

The Business Outlook

Summer sets in without any sign that business is going to break through the bottom on which it has been stabilizing itself for six months. The seasonal letdown in the general level of activity seems, on the whole, to be little if any more than usual so far, and in some respects slow improvement since the beginning of the year has become evident. This is most marked in trade lines closest to the consumer, where low prices and accumulated attrition on the second pair of pants appear to have stimulated replacement of current requirements.

—The Business Week, June 24.

Construction Costs in Wichita

Contractors in Wichita, Kan., are paying the scale for some trades and 15 per cent below scale for other trades. Further reductions are not likely. Rates being paid are $1.50 for bricklayers, $1.25 for plasterers, $1 for carpenters, 75c. for ironworkers, 60c. for semi-skilled labor and 40c. for common labor.

Prices actually being paid for principal materials include 4.5c. for structural steel, $30 for structural timbers, $1.46 for cement without bags, $90 per 1,000 for hollow tile and $14 for common brick. Prices are steady.

Recent costs include $15 per ton for structural steel erected and $6.50 per cubic yard for reinforced-concrete building foundations.

Concrete Pavement Yardage

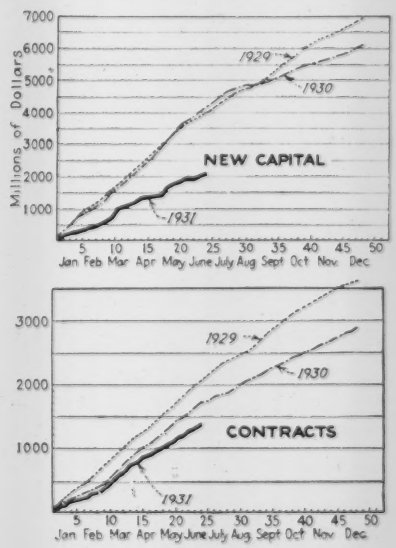
There is given below a tabulation of pavement yardage awarded in the United States during the month of May, divided according to roads, streets and alleys, and the totals as of May 30, 1931.

	May, 1931	To May 30
Roads	10,038,207	67,132,620
Streets	2,206,198	8,515,030
Alleys	58,459	303,345
Total	12,302,864	75,950,895

Capital and Contracts

New capital issued in the current week totaled 34 millions private and 35 millions public. The principal issues were $21,000,000 Safe Harbor Water Power Corp. 4½s for power development, $15,000,000 Louisiana highway 4½s, and $3,000,000 Monmouth County (N. J.) highway 3½s. Total to date is 2,079 millions, compared with 4,059 in 1930, a drop of 49 per cent.

Last week's contracts totaled 57 millions, compared with 39 millions the week before and 70 millions a year ago. The cumulative total is 1,349 millions, against 1,779 a year ago, a drop of 24 per cent.



Brief News

WORK HAS STARTED on a new $1,000,000 postoffice for Springfield, Mass. The N. P. Severin Co., Chicago, has the general contract. Foundation piling are now being driven by the Raymond Concrete Pile Co.

THE CONTRACT for the replacement of the 300-ft. span of the Second Narrows bridge over Burrard Inlet, Vancouver, has been awarded to the Dominion Bridge Co.

WORK of the U. S. Reclamation Bureau will be depicted in a special exhibit at the forthcoming World's Fair in Chicago. Planning for the exhibit already has begun. When completed it is expected to represent an expenditure of $150,000.

A BOND ISSUE of $350,000 has been passed by the Howard Flat Irrigation District, near Wenatchee, Wash., to provide funds for construction of an irrigation system that will water about 1,400 acres of land in the district. Willis T. Batcheller, Seattle, is preparing plans for the work.

PLANS have been made for the construction of a pumping plant with a capacity of 10,000 gal. per min. to water a block of 1,500 acres of land across the Columbia River from Wenatchee, Wash., by the United Water Co., recently organized. The plant contemplates the laying of nearly 10,000 ft. of main pipe line 10 to 26 in. in diameter.

RESIDENTS of the city of Compton, Calif., near Los Angeles, have voted to join the Metropolitan Water District of Southern California, which proposes to build an aqueduct to bring water to southern California cities from the Colorado River. Compton is the fifteenth city to join the district.

CONSTRUCTION and equipment of a hydrographic survey steamer for service on the Pacific coast has been contracted for by the Canadian government with the Collingwood Shipyards, Ltd., at a price of about $600,000. The vessel will be 214 ft. long by 36 ft. wide and will be fitted with all the latest appliances for marine survey work.

THE POWER DISTRIBUTING SYSTEM of the Niagara, Lockport & Ontario Power Co. has been bought by the city of Jamestown, N. Y., subject to the approval of the Public Service Commission. Of the purchase price of $750,000, $300,000 is to be paid in cash when the city takes possession and the balance at the rate of $100,000 a year for four years and $50,000 the fifth year.

THE EAST BOSTON SHAFT of the Boston-East Boston vehicular tunnel has been completed and is now ready for the shield. The tunnel, nearly a mile long and 31 ft. in diameter, will be driven from the east end only. It is being built by the Boston transit department under the direction of Thomas F. Sullivan. The Silas Mason Co., Inc., is contractor.

Personal Notes

O. H. AMMANN, of New York, designer of the Hudson River Bridge, has been honored with the degree of Doctor of Engineering by New York University.

PICHEGRU WOOLFOLK, who has been associated with the Bartlett-Hayward Co., Baltimore, since 1914, has been appointed assistant general manager of the company.

JAMES H. WILEY, assistant chief engineer of the North Dakota board of railroad commissioners, has been appointed chief engineer to succeed E. H. Morris, who has resigned.

HOWARD EDWARD BOARDMAN, construction engineer of the Boston & Maine Railroad, has been appointed Dudley professor of railroading at Yale University.

JOHN R. FREEMAN, of Providence, R. I., past-president of the American Society of Civil Engineers, was honored with the degree of Doctor of Science by Yale University last week.

S. F. NEWKIRK, JR., formerly superintendent and engineer for the Elizabethtown Water Company Consolidated, Elizabeth, N. J., is now superintendent and engineer for the board of water commissioners, city of Elizabeth.

SAMUEL GREEN, who has served several terms as roads engineer for Baltimore County, with headquarters at Towson, Md., has been appointed chief engineer of the metropolitan sanitary district of the county, succeeding Bernard L. Crozier, recently appointed chief engineer of Baltimore. JACKSON GRAYSON, assistant to Mr. Green as roads engineer, will be Mr. Green's successor.

W. W. LANE, former Arizona state engineer, has been named general manager and district engineer for Maricopa County Water Conservation District No. 1, known as the Beardsley project. The district has been reorganized and a new plan of operation established calling for conservative but active development of the project.

FRANK J. O'HARA, formerly assistant chief engineer for the Salt River Valley Water Users' Association, with headquarters in Phoenix, Ariz., has established an office in San Francisco, where he will engage in private practice as a consulting engineer.

EARLE H. MORRIS, for the past eleven years chief engineer of the board of railroad commissioners of the State of North Dakota, has been appointed chief engineer of the Public Service Commission of West Virginia.

O. N. MUNN, port engineer of Bellingham, Wash., since 1925, has resigned. As the engineering work planned has been completed, no successor will be appointed.

JAY T. WILLIAMS, civil engineer, who has been chief building inspector for the city of Denver, Colo., for the past eight years, has resigned to engage in private practice.

SOCIETY CALENDAR

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; summer meeting, Tacoma, Wash., July 8-10.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS will hold its annual meeting in Salt Lake City, Sept. 28 to Oct. 1. This city was chosen by the executive committee because only one of its annual meetings has been held west of the Rocky Mountains. Six years ago the association met in San Francisco.

EASTERN SECTION, Seismological Society of America, met on June 11-12 at Columbia, S. C. In a communication John R. Freeman, who was unable to be present, laid stress on the feasibility of erecting at reasonable cost buildings that are safe from earthquake damage and on the fact that people fear too greatly earthquake damage to well-built buildings. N. H. Heck, secretary of the section, outlined the proposed program for investigation of strong earthquake motions in California to be carried on by the U. S. Coast and Geodetic Survey. Instruments suitable for recording strong earthquake motions which have been recently completed were shown and described by Frank Wenner, of the U. S. Bureau of Standards, and Arthur J. Weed, of the University of Virginia, the former for accurately recording the information needed by the engineer and the latter an inexpensive recorder for wide distribution. Alexander McAdie, of Harvard University, stressed the importance of proper engineering in city planning to reduce earthquake loss.

SAN FRANCISCO SECTION, American Society of Civil Engineers, at its regular bimonthly meeting on June 16, heard an address by Prof. George E. Beggs, professor of civil engineering, Princeton University, illustrated by lantern slides, on "The Use of Models in the Design of Arch Dams, Arch Bridges, Continuous Frames and Suspension Bridges."

Obituary

FRED WILSON, 82 years of age, who made the original survey for Fort Laramie, Wyo., in 1873, died June 11 at his home near Lusk, Wyo.

LOUIS H. GIPP, president of the Gipp Construction Co., Buffalo, N. Y., was crushed to death by a gravel truck on June 17. Mr. Gipp had been in the construction business for more than 40 years. He built the Niagara Falls Boulevard, between Buffalo and Niagara Falls.

PENNELL CHURCHMAN PAINTER, formerly city manager of Greensboro, N. C., died suddenly in that city on June 18. Mr. Painter was at one time an engineer with the Baltimore park board and the old paving commission of that city. He had also served as an engineer on the Panama Canal, as a federal engineer on road construction in Nebraska and as city engineer for Washington, N. C.

JOHN C. U. CHRISTENSEN, chief designer of the Cincinnati Union Terminal project, died in Ocean Grove, N. J., on June 16. Mr. Christensen was a native of Denmark and was graduated in civil engineering from the Polytechnic College in Copenhagen in 1903. Coming to this country soon after his graduation, he had filled engineering positions with various railroads. In 1927 he became structural engineer for the Cincinnati Union Terminal Co.

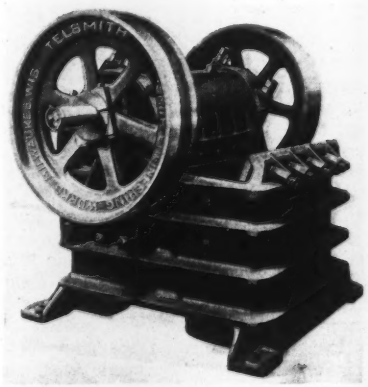
Construction Equipment and Materials

Roller-Bearing Crusher of Swinging Jaw Type

With the acquisition last year of the crusher department of the Wheeling Mold & Foundry Co., the Smith Engineering Works, Milwaukee, Wis., acquired the Wheeling jaw crusher, equipped with anti-friction bearings. This unit, with a number of important changes in the bearings, adjustment and jaw-clamping devices and main structure, is now being produced as the Telsmith-Wheeling jaw crusher in four sizes, 9x16, 21, 30 and 36 in.

The main frame consists of an annealed cast-steel casting reinforced by heavy horizontal ribs. An adjusting wedge and toggle block slide on planed surfaces, and the front end of the frame is machined to take the stationary jaw die. To assure true alignment of the shaft and its bearings the frame is bored on both sides in a single process. Annealed cast steel is also used for the swinging jaw, which is equipped with deep substantial vertical ribs. A replaceable toggle bearing is now inserted between the toggle and swinging jaw, protecting the jaw casting against toggle wear. An eccentric shaft both supports and actuates the swinging jaw; it is made of hammered carbon-vanadium steel, ground and polished. Thrust collars take all wear due to end-thrust. The shaft unit is readily removable by taking off the main bearing caps. Messinger roller bearings are used in both swinging jaw and frame, each bearing protected by a piston-ring seal to prevent the entry of dirt or loss of lubricant. Stationary and swinging jaw plates are made of manganese steel and are clamped rigidly in place by wedge blocks. Dies are reversible.

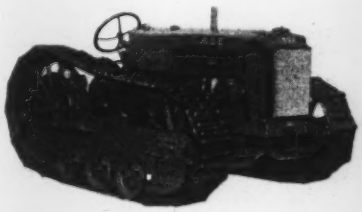
This type of crusher has a peculiar action. The upper part of the swinging jaw moves outward to crush the coarse rock, then retreats. As the upper stroke terminates, the lower part of the jaw moves forward to finish the crushing action. This stroke is said to be very effective, particularly in producing smaller sizes of rock. The length of the lower crushing stroke is altered by changing the position of the toggle. Adjustment can be made while the crusher is running. Lubrication of roller bearings and toggle bearings is by the Alemite-Zerk system of high-pressure grease lubrication. Steam cylinder oil is used for eccentric shaft bearings.



Jaw crusher

Crawlers Fitted to Tractor

Application of the crawler unit made by the Trackson Co., Milwaukee, Wis., to the model CI Case tractor of the J. I. Case Co., Racine, Wis., has resulted in the production of a flexible power unit able to work under unfavorable ground or weather conditions. One of the notable advantages of this combination is the open design and wide clearance between the crawlers and the motor, providing ample space for extra equipment such as hoists, bulldozers, graders and similar units.

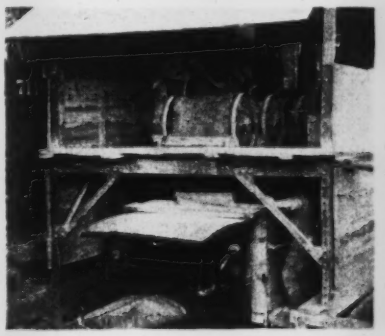


Tractor equipped with crawler treads

Bulk Cement-Handling Plant

Utilization of existing equipment for handling bulk cement has enabled the George O. Harm Co., Warren, Ohio, to develop a complete plant for handling bulk cement from railroad car to the batch mixer, including the accurate weighing of the cement content of each batch. Unusually economical in labor, this set-up also results in rapid and efficient loading of the batch trucks and in the virtual elimination of cement losses.

From the railroad car the cement is conveyed to a loading platform by Turn-Lo cement carts especially designed for this purpose. Each of these consists, essentially, of a revolving drum mounted on a pair of wheels. The lip of the drum is only 25 in. from the floor, and its capacity is sufficient for a 7½-sack batch of cement. After the carts are loaded they are wheeled to a platform scale, where the weight is adjusted to secure the exact amount of cement needed for a batch. From the scale the cars are wheeled to position over movable chutes, to which they are connected by a steel apron, attached to the bottom and so fastened that when the car is moved the chute moves with it. When a truck stops beneath the charging platform, carts and chutes are moved as units into position over Turn-O-Matic cement boxes mounted on the truck. Transfer of the cement is accomplished quickly with a minimum of dust by simply turning over the revolving drum. One, two or three batches of cement can be discharged simultaneously, according to the truck capacity.



Loading batch truck with cement

The loading plant is usually operated by four men, three to load and operate carts and one to open and close the lids of the truck boxes. Sometimes an additional man is used to help load the carts. Contractors report that they are handling between 500 and 600 bbl. of cement per day and that the work is easier on the men than handling sacks. Advantages of the system include savings in money due to purchasing cement in bulk, elimination of investment in sacks and for labor in emptying, gathering up and bundling sacks; quicker action at the paver; and the possibility of storing batches in the truck for an indefinite period in case a sudden storm or a breakdown of the mixer.

Concrete Body Improved

Motor truck bodies produced by the Chain Belt Co., Milwaukee, Wis., for the mixing or conveying of concrete now contain a number of refinements designed to decrease obsolescence. These include the provision of a water-control mechanism which, when once set for the proper amount of water, will remain accurate for an indefinite period. Also, a new discharge control has been developed by which the operator, with a single turn of a hand wheel, can obtain either full discharge or a mere trickle of concrete. To help place the mixed concrete in the forms, a suitable discharge spout has been designed. The mechanism has been so designed that concrete is delivered at a high elevation and can be discharged regardless of the

Concrete mixer body

angle of the truck, either lateral or transverse. At the same time the body is lighter and lower than any previous model. It is equipped with a separate mounting, with reduction gears of heat-treated steel inclosed in a belt housing and operating in a constant bath of oil, and can be mounted on any type of truck or trailer.

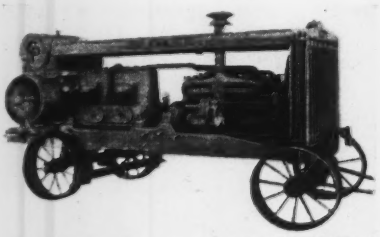
Nickel-Clad Steel Plate

Combining the resistance to corrosion and other advantages pertaining to pure nickel with the structural strength of steel plate at a price economical for tanks and many other forms of heavy plate construction, a new hot-rolled bimetal of pure nickel and steel is now being produced by the Lukens Steel Co., Coatesville, Pa., in the form of hot-rolled plates made up of a layer of pure solid nickel and a heavier layer of high-grade flange steel. In the hot-rolling process the two are welded together. The product is available in all sizes of plates $\frac{3}{16}$ in. thick and up, and in two grades in which the nickel makes up 10 or 20 per cent of the total plate thickness. Flanged and dished heads are also available.

Six-Cylinder Motor Drives 360-Ft. Portable Compressor

Vibrationless performance is claimed for the latest addition to the line of portable air compressors manufactured by the Chicago Pneumatic Tool Co., New York City, as the result of the use of a six-cylinder heavy-duty motor and of a counterweighted compressor crankshaft. This unit is rated at 360 cu.ft. per minute and can be mounted on steel- or rubber-tired wheels, on skids or on a trailer.

The compressor is of the vertical, four-cylinder, single-acting type. Cylinders are completely water jacketed, cast in pairs and bolted to the crankcase. Inlet and discharge valves are of the Simplate design, making possible high volumetric efficiency and low power consumption per unit of air delivered. The crankcase is fitted with large oiltight removable doors for easy adjustment of the bearings. The pistons, of light cast iron, are fitted with two ventilated oil-control rings. Piston pins of the full-floating type are used.



360-cu.ft. air compressor

A gear-type oil pump driven by the crankshaft forces oil under pressure to every moving part through drilled crankshaft and connecting rods.

Power is provided by a Hercules model HXE six-cylinder motor equipped with double scavenging oil pump, Bosch magneto and pressure lubrication. The engine affords a large excess of power capacity over that actually required by the compressor and, as it operates at only 790 r.p.m., is assured of long life and minimum maintenance. It is equipped with an automatic idling device which slows the motor down when air pressure in the receiver reaches a predetermined maximum and speeds it up just prior to picking up the compressor load.

Motor and compressor are connected by a flexible coupling which can be disengaged by loosening four nuts. Cooling water for both compressor and engine is circulated by the engine pump through a tubular radiator cooled by a fan. The radiator core is built in sections and is protected by stout steel bars. The deck upon which the unit is assembled is a one-piece steel casting of great strength and rigidity. This supports the motor, compressor, gasoline tank and an all-riveted air receiver equipped with drain valve, fusible plug, safety valve and pressure gage. Every unit is regularly supplied with steel canopy top and steel sides, which can be locked in place. Both compressor and engine are equipped with air cleaners and oil filters as standard equipment.

New Publications

Hoover Dam—"White Gold" is the title of an interesting booklet telling in narrative form the history, development and plans for the Hoover Dam on the Colorado River. Copies may be obtained from the American Steel & Wire Co., 208 South LaSalle St., Chicago, Ill.

Gravel Equipment—Bulletins have been issued by the Pioneer Gravel Equipment Mfg. Co., 1515 Central Ave., Minneapolis, Minn., describing the model 22 portable gravel plant, which screens, crushes and loads in one operation, and the Pioneer dragline.

Pumps—Hayton Pump & Blower Division of the International-Stacey Corp., Connersville, Ind., has issued a new bulletin 160-B10 on centrifugal pumps, featuring the open impeller-type multi-stage pump.

Road Machinery—Two folders of the Austin-Western Road Machinery Co., 400 North Michigan Ave., Chicago, Ill., describe Austin tandem motor rollers and Western maintenance graders.

Protective Coating—Uses of bituminous enamel as a protection against deterioration of steel tanks and pipe lines are discussed in a 14-p. illustrated pamphlet issued by the W. A. Briggs Bitumen Co., 15 Moore St., New York City.

Excavating Equipment—Thew Shovel Co., Lorain, Ohio, has issued a 66-p. illustrated catalog describing in detail the Lorain model 75, 55 and 45 excavators.

Diesel Engines—A discussion of the advantages of diesel power and a general description of I-R diesels ranging from 150 to 1,200 hp. are contained in a 16-p. illustraed bulletin issued by the Ingersoll-Rand Co., 11 Broadway, New York City.

Business Notes

Pacific States Cast Iron Pipe Co., Provo, Utah, has been awarded a contract for the water-distribution system at Boulder City, Nevada, the new town being constructed near the site of the Hoover Dam. The contract covers 9 miles of McWane cast-iron pipe ranging in size from 2 to 12 in.

Colvolc Rubber Co. is the new name adopted by the Hitchcock Co., Inc., in order to identify the company more closely with its product. Coincident with the change of name, the general office of the company has been moved from Boston to Norfolk Down, Mass.

Hilton Steel Co., with general offices and plant at Warren, Ohio, has been organized as an engineering and general plate-fabricating plant by Jack L. Hilton, formerly manager of the Dalzell Bros. Co., Youngstown, Ohio, and prior to that associated with the Commercial Shearing & Stamping Co. and the Heltzel Steel Form & Iron Co. Associated with Mr. Hilton as secretary of the company is A. F. Steele, and, as vice-president in charge of production, R. A. Zeyfang.

Osgood Co., Marion, Ohio, has opened a new permanent sales and service branch for the Greater New York territory at 1038 Hoyt Ave., Ridgefield, N. J.

Hungerford & Terry, Inc., Clayton, N. J., has placed H. R. Myers, for the past six years chief engineer of the company, in charge of the New England territory, with headquarters at Boston, Mass. He succeeds D. R. Weedon, who has severed his connection with the company.

Bartlett-Hayward Co., Baltimore, Md., announces the election of Chester F. Hockley as president and general manager to succeed Howell Fisher, who has severed his connection with the company to devote his time to travel. Albert C. Bruce, who has been associated with the company for many years, has resigned as vice-president to devote his entire attention to his duties as president of the U. S. Hoffman Machinery Corp.

Joseph T. Ryerson & Son, Inc., Chicago, Ill., which some time ago purchased an interest in the Reed-Smith Co. of Milwaukee, Wis., has acquired the remaining stock of the firm, which now becomes the Reed-Smith plant of Joseph T. Ryerson & Son of Wisconsin, Inc.

Chicago Pneumatic Tool Co., New York City, announces the election as executive vice-president of W. L. Lewis, who for the past year has been vice-president in charge of finance and was formerly assistant comptroller of the Bethlehem Steel Corp. Our issue of June 4, p. 950, contained an erroneous announcement of the appointment of H. A. Jackson to this position. Mr. Jackson has been and continues as president of the company.

Independent Pneumatic Tool Co., Chicago, Ill., has appointed William L. Beck manager of the distributors division. His duties will consist in contacting the dealer trade in connection with the development of a resale organization for air compressors and tools. Mr. Beck has had previous connections with the Gardner-Denver Co., the Harnischfeger Corp. and the Austin Machinery Corp.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has elected S. M. Kintner vice-president in charge of engineering to succeed W. S. Rugg, who has been elected vice-president in charge of sales. Mr. Kintner, a graduate of Purdue University, was formerly an assistant vice-president of the company.

W. M. Rynerson, New York representative during the past fourteen years for the Carter Bloxonend Flooring Co., Kansas City, Mo., died in New York City on May 29 at the age of 69.

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	Project	Cost	Status
Excavation and Dredging			
Milwaukee	Ferry slips, bulk heads, etc.	$1,500,000	Proposed
Railways			
Texas	Railway extension	4,000,000	Proposed
Unclassified			
Texas and Louisiana	Pipe line	1,350,000	Proposed
Factories and Mills			
Wilmington (Del.)	Chemical plant	5,000,000	Proposed
Buildings			
Worcester	Auditorium	2,000,000	Bids asked
Evanston (Ill.)	University building	1,000,000	Proposed
South Bend (Ind.)	Memorial fieldhouse	1,000,000	Proposed
Newark	High school	1,080,000	Proposed

WATERWORKS

PROPOSED WORK

Ark., Glenwood — City Council waterworks. E. T. Archer & Co., 609 New England Bldg., Kansas City, Mo., engrs.

Calif., Calexico—City Council 3.5 mi. 4 and 6 in. water pipe, 100,000 gal. steel water tank, with 100 ft. tower, small pumping plant with motor driven pumps 100 g.p.m. capacity. T. Byl, city engr.

Calif., Watsonville—City Council Shingle Mill Creek Dam, rein.-con., at Grizzly Flat. $200,000. H. B. Kitchen, city engr.

Ind., Bluffton—Plans waterworks. $15,000. Address City Clerk.

Ind., Muncie—Muncie Waterworks Co., waterworks improvements, incl. 7 m.g. turbine centrifugal pump, 100 kw. generator. $200,000. C. E. Stewart, supt. works.

Ia., Ames—Preliminary plans water softening plant. $30,000.

Mass., Cambridge — Extending Stony Brook Reservoir, $225,000; large distribution mains, $365,000; 12 in. mains for East Cambridge, $30,000; motors, $30,000; Fresh Pond Reservoir improvements, $100,000; filter bed, $100,000. **Maturity indefinite.** Hazen & Everett, 25 West 43rd St., New York, engrs. Noted June 4.

Mass., Weston — Town, Water Comn., soon takes bids water standpipe. $15,000 or more. Metcalf & Eddy, Statler Bldg., Boston, engrs. Noted June 4.

Mo., Maryville — Additional filter unit for existing water purification plant.

N. J., Old Bridge — East Brunswick Twp. Com., Town Hall, mains, valves, hydrants, through various streets. $30,000. R. Wilson, 46 Paterson St., New Brunswick, twp. engr.

Pa., Altoona—Surveys 2 reservoirs, probably concrete core dams with earth, rubble stone surfacing on upper side, earth fill on lower side, concrete spillway. H. J. Baum, City Bldg., engr. Fuller & McClintock, Pennsylvania Bldg., Phila., consult. engrs.

Pa., Bedford—Boro reservoir. C. E. Lee, boro. engr. S. C. Hulse, Bedford, consult. engr.

Pa., Waynesburg — Waynesburg Water Co. soon takes bids 80 m.g. earth impounding dam with concrete spillway, incl. 24,000 cu.yd. earth fill, 500 cu.yd. concrete in spillway, near here. Gates and c.i. pipe reserved by owners. Private plans.

Tex., Gladewater—City, c/o B. F. Phillips, preliminary plans waterworks and sewerage systems. F. J. Von Zueben, D. Waggoner Bldg., Fort Worth, engr. Noted May 7.

Tex., Overton—Waterworks, incl. distributing system, 25,000 lin.ft. 6 in. c.i. pipe, pumping unit, tank and tower, $40,000. H. L. Thackwell, Jacksonville, engr. Noted June 18.

Utah, Provo—City Council preliminary plans 600 ft. earth dam, 25 ft. high, to impound 1,000 ac.ft. water. $20,000. F. Deming, city engr.

Wash., Burlington—Oregon-Washington Water Co., improving filtering plant and establish pipe connection with Skagit River to replace present well source of supply. $15,000. Private plans.

BIDS ASKED

Calif., Alhambra—June 30, by City Council, 700,000 gal. unit reservoir 72 ft. diam., 20 ft. deep on Dupuy Hill. $15,000.

Calif., Calexico — City Council taking bids furnishing, laying 2 mi. 4- to 8-in. mains; furnishing 1,000 gal. booster pump, 40 hp. electric motor for Water Dpt. T. Byl, city engr. Noted June 18.

Calif., San Francisco—July 1, by S. J. Hester, secy. Bd. P. Wks., deepening 2 to 12 wells and drilling 2 to 6 wells, in Pleasonton. $38,000.

Mass., Boston — June 26, by Dpt. P. Wks., J. A. Rourke, comr., high pressure fire pipe in Washington and Tremont Sts., Broadway and City Hall Ave. $100,000 bonds.

Mo., Memphis—June 30, by H. Wagner, city clk., earthen dam, spillway, 650 ft. 6 in. c.i. flow line. W. B. Rollins & Co., 339 Railway Exch. Bldg., Kansas City, engrs. Noted Apr. 9.

N. J., Paterson—July 6, by Passaic Valley Water Comn., 156 Ellison St., industrial service distribution main, appurtenant work. Contr. 7. Fuller & Everett, 25 West 43rd St., New York, engrs.; adv. E.N.-R. June 25.

N. Y., Brooklyn—June 30, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Linden and Shore Blvds., Alabama, Miller, 15th, Pennsylvania Ave., Vermont, Bradford, Douglass, Freeman, Herkimer, Milton, Quincy, Rock, Taylor, Woodhull, 73rd, 77th, East 35th, East 8th, and East 104th Sts.

N. Y., Long Island City—June 30, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in grounds pumping station 3, Vernon, Woodhaven, and Hammels Bldvs.; 57th and 58th Rds., Thomson, Bordon and Grand, Calamus, 47th, 73rd, 74th, 9th, 57th, 58th and 60th Aves., 89th, 96th, Main, 142nd, Beach 87th and Beach 97th Sts.

N. Y., St. George—June 30, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in McNeisch Lane, Four Corners Rd., Stevenson Pl., Cromwell, Greenleaf, Hartford, Heberton, Ridgewood, Simonson, and Van Pelt Aves.

CONTRACTS AWARDED

Ga., Thomasville—For 3 story, water softening plant, 1½ m.g.d.c., to P. Jinright, Thomasville, $19,388; water softening equipment, to Burford, Hall & Smith, Red Rock Bldg., Atlanta, $16,900; tank and scrubbers, to R. D. Cole Mfg. Co., Newman, $2,512; clarifier machinery, to Dorr Clarifier Co., 1503 Candler Bldg., Atlanta, $2,475; hydraulic elevator, to Otis Elevator Co., 39 Harris St., N. E. Atlanta, $1,926. Grand total $43,201. Noted May 21.

Ia., Burlington—Citizens Water Co., F. D. Lawlor, supt., 314 North 4th St., fireproof pumping station 15 x 18 ft. inside dimensions, 14 ft. high, to A. Danielson & Son, Burlington, $1,517. Noted Apr. 30.

Mo., St. Louis — N. L. Meston, city supply comr., City Hall, 5,000 lin.ft. 36 in. pipe, f.o.b. St. Louis, to McClintic Marshall Co., Bell Telephone Bldg., St. Louis, Mo. and Oliver Bldg., Pittsburgh, Pa. $28,800. Noted Apr. 2.

Kan., Kansas City — Bd. P. Utilities, C. A. Lowder, secy., piping at water and light plant, incl. steel and water pipe valves, fittings, regulators, specialties, meters, installation and painting, welding pipe, tanks, installing equipment purchased in previous contracts, to Interstate Heating & Plumbing Co., 1307 Bway., Kansas City, Mo., $83,986. Noted May 14.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Columbus Ave., to N. DiStefano, 378 Woodstock Ave., West New Brighton, $15,700; and in Colden and Edson Aves., to L. D. Gregory, 158 26th St., $6,121. Noted June 4.

Tex., Houston — City, c/o W. E. Monteith, mains in connection with proposed northeast water plant, to Tellepsen Constr. Co., 3900 Clay St., $12,902. Noted June 4.

Wis., Milwaukee — Dpt. P. Wks., City Hall, mains in West Lison Ave., to Mierswa Constr. Co., 463 21st St., $3,429; South 1st and East and West Center St., to Milwaukee Sewer & Drainage Co., 2110 North Humboldt Ave., $6,263 and $5,379 respectively. Grand total $15,072. Noted May 24 Daily.

Wis., Milwaukee—City, D. McKeith, comr., mains in West Capitol Dr., to Zimmermann & Zimmermann, 3402 West Wisconsin Ave., Milwaukee, $31,238. Noted June 18.

Ont., St. Thomas—W. C. Miller, city engr., general contract water filtration plant, to Green Lumber Co., St. Thomas, $14,618; supplying, installing equipment, to W. J. Westaway Co., Westaway Bldg., 38 Main St. W., Hamilton, $34,480. Noted Apr. 30.

SEWERS

PROPOSED WORK

Calif., San Mateo—City Council 6,160 ft. 6- to 18-in. vitr. pipe, 25 manholes, wye branches in Bayshore Hy. E. P. Wilsey, city mgr.

Conn., Litchfield — Town, distribution main, filter bed, underdrain sand filter and gravity line. $60,000. Morris Knowles, Inc., Westinghouse Bldg., Pittsburgh, Pa., engrs.

Ind. Huntington — Sewage disposal plant. $45,000. A. Dungam, mayor. L. G. Finch, engr. State Bd. Health, investigating stream pollution due to suit against city.

Kan., Topeka—Preliminary plans 1,800 ft. 36 in. storm sewers from Santa Fe Station eastward. $25,000. W. E. Baldry, City Hall, engr.

La., Minden—City Council extending sewerage system. $50,000. E. T. Archer & Co., New England Bldg., Kansas City, Mo., engrs.

Mass., West Springfield (br. Springfield)—Town rejected bids sanitary and storm sewers in Cold Spring Ave., Haywood, York and Westfield Sts. $58,000.

Mich., Dearborn—For 48 in. concrete and vitr. sewer with brick and concrete manholes for River Rouge Interceptor, Sect. 58. $30,000. F. R. Storrer, Dearborn, engr.

N. J., Clifton—Bd. City Council, City Hall, storm water drains in Speed Ave. $25,000. **Maturity probably soon.** J. L. Fitzgerald, city engr.

O., Cleveland—City, withdrew bids to have been opened June 17, Big Creek Intercepting Sewer to Bellaire Ave., Sect. 2. To exceed $25,000. Noted June 4.

Okla., Oklahoma City — City Council preliminary plans sanitary sewer extensions in Lindsay and Walnut Sts. $27,600. L. M. Bush, City Hall, engr.

See proposal advertising on page 83

Constr. News page 275

LEADITE

Trade Mark, Registered U.S. Pat. Office

60" Submarine Suction Line for Intake —*with LEADITE JOINTS*

This is one of a number of Submarine Pipe Lines which have been successfully "jointed with LEADITE." The very nature and importance of a Submarine Line demands "absolute confidence" in a jointing material,—and LEADITE has justified that confidence many times over.

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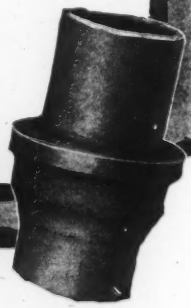

Sewers (Continued)

Okla., Oklahoma City — City Council preliminary plans Portland Ave. Intercepting Sanitary Sewer. $100,000. L. M. Bush, City Hall, engr.

Okla., Oklahoma City — City Council preliminary plans Santa Fe Ave. Storm Sewer. $75,000. L. M. Bush, City Hall, engr.

Okla., Oklahoma City — Preliminary plans sanitary sewers in Cummins Addition. $45,000. L. M. Bush, City Hall, engr.

R. I., Providence—Sewerage works in Swan, Sweetbrier, Corina, Glasgow, Appian and Anchor Sts. $25,000-$30,000.

Tex., Overton—City, c/o M. Wilson, mayor, 30,000 ft. sanitary sewers. $35,000. H. L. Thackwell, Overton, engr. Noted June 18, under "Waterworks."

BIDS ASKED

Ark., Fort Smith—See "Streets and Roads."

Ill., Chicago—July 16, by J. J. Sullivan, clk. Bd. Trustees Sanitary Dist. of Chicago, 910 South Michigan Ave., Calumet Sewage Treatment Works, Div. C; adv. E.N.-R. June 25.

Ind., Butlerville—June 29, by Bd. Trustees Indiana School for Feeble Minded, new sewage disposal plant at Farm Colony. C. A. McGonagle, supt.

Kan., McPherson—July 7, by City Council, E. Lundstrom, city clk., main sewer and sewage treatment plant, incl. lines from 2 existing plants, control building, equipment, machinery, settling tank, round or square rock filter beds, resettling tank, digester, sludge drying beds, bypasses, miscellaneous piping, valves, equipment, concrete work, sidewalks, driveways, fencing, excavation, grading. L. C. Angevine, city engr. E. T. Archer & Co., New England Bldg., Kansas City, Mo., consult. engrs.

Mass., Norfolk—June 26, by Dpt. P. Health, Pondville Hospital, filter beds, sludge beds, settling tanks, dosing tanks, new sewers, alterations, sewer appurtenances, for Commonwealth of Massachusetts, Dpt. P. Health, State House, Boston. Noted May 14.

Mich., Lansing—June 29, by B. Ray, city clk., North End Main Trunk Sewer. 4,500 ft. 7 ft. 6 in. diam. rein.-con. or three ring brick pipe.

Minn., Duluth—June 29, by J. Wilson, city engr., sewage disposal plant. Total est. $570,000. Alvord, Burdick & Howson, 8 South Dearborn St., Chicago, Ill., consult. engrs.

N. J., Union—July 30, by Township Com., Town Hall, 3,855 lin.ft. 8 and 10 in. sanitary sewers in Hillside Ave. $25,000 or more. H. Kreh, Jr., Falls Bldg., twp. engr.

N. Y., Brooklyn—July 1, by H. Hesterberg, pres. Brooklyn Boro. Boro Hall, sewers in Delamere and Mansfield Pls., East 38th, Hendrickson, and East 27th Sts.

N. Y., Clavcrack—July 2, by Superintendent Purchase, Capitol, Albany, sewage disposal at New York State Training School for Girls, Columbia Co.

N. Y., Long Island City—June 29, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., storm and sanitary sewers in 215th and Delaware Pls., 120th, 110th, 45th and 58th Rds., 60th Lane, 45th and 84th Drs., Edgerton, Bell and Northern Blvds., Caldwell, Cooper (Central), Metropolitan, Griffin, 89th, 42nd, 107th, 90th, 91st, 36th, 120th, 121st, 114th and 111th Aves., 211th, 212th, 213th, 238th, 208th, 216th, Archer, 178th, 161st, 194th, Long, 157th, 203rd, 139th, 138, 143rd Sts.

N. Y., St. George—July 1, by J. A. Lynch, pres. Richmond Boro, Boro Hall, temporary sanitary sewers in Hillside Terrace; grading Midland Ave.

Okla., Nichols Hills (Oklahoma City, P. O.)—June 29. T. A. Montague, city clk., sanitary lateral sewers in Dist. 2. $25,000. Benham Eng. Co., Perrine Bldg., Oklahoma City, engrs.

Wis., Milwaukee—June 30, by Metropolitan Sewerage Comn., main sewer in Dean and Green Tree Rds. $250,000. J. L. Feberee, Milwaukee, ch. engr.

CONTRACTS AWARDED

Ark., Blytheville—Commissioners of Sewer Impvt. Dist. 3, City Hall, sewerage system, incl. laying 37,000 ft. piping, disposal plant, 2 pumping plants, to Volz Constr. Co., Baltimore Bldg., Memphis, Tenn., $61,000. Noted May 7.

Calif., Calexico—City Council, vitr. sewers, manholes in 4th and 5th Sts., et al., to Drainage Constr. Co., 12,240 Bellevernon Ave., Lynwood, $189,515.

Conn., Bridgeport—Sewer Comn., City Hall, laying 4,800 ft. 12- to 48-in. c.i. and rein.-con. sewer lines, West End Trunk, to Bridgeport Dredge & Dock Co., 1024 Main St., $10,200; Nelson Terrace, Andover, Bird, Hunting and Foster Sts., to Bridgeport Constr. Co., 35 Milne St., $4,171; Huntington Rd. and Concord St., to N. D'Addario, Park View Ave., $7,205. Grand total $21,576. Est. $40,000.

Conn., Hartford — State sewage disposal system at State Sanatorium, Cedarcrest, to C. W. Blakeslee & Son, 37 Waverly St., New Haven, $31,028. Est. $60,000. Noted June 4.

D. C., Wash.—District Comrs., District Bldg., to W. F. Brenizer Co., 1501 South Capitol Ave., storm water sewer in Macomb St., $23,719, 13th St. Replacement Sewer $7,455, sanitary sewer in Massachusetts Ave. $5,527, combined sewerage system in Concord Ave. $8,592; to J. B. McCreary Co., Wash., D. C., Barry Farms Sanitary sewer at Stanton and Sheridan Rds., S. E. $13,743; to J. B. Rubino, 2020 Rhode Island Ave., replacement sewer in 8th St., $11,514. Grand total $70,550.

Mass., Middleton — Essex Co. (Salem), sewerage works at Essex Co. Farm, to M. E. Hamlin, 2 Clifton Ave., Salem. Est. $25,000.

Minn., Albert Lea—City, A. E. Carlson, clk., 18,611 lin.ft. 8-18 in. vitr. clay pipe, 91 standard manholes, 8 drop manholes, to T. Jensen, St. Cloud, $39,386—rein.-con. sump and pump pits for sewer lifts, to Tapager Constr. Co., Albert Lea, $3,490. Rejected bids June 4 pumping equipment, new bids for same to close June 16. Noted May 28.

Neb., Sidney—City, for 8,860 ft. 10, 12 and 15 in. sanitary sewers, fifty-five 6 x 12 in. and fifty 6 x 10 in. wyes, 29 manholes, 1 sewage disposal plant, sewer outfall, 1 sludge drying bed, to T. P. Thompson, 3908 Forest Ave., Kansas City, Mo., $17,184; 6,295 ft. 10- to 48-in. vitr. clay or cement storm sewers, 1,100 ft. open ditch, 68 inlets, 14 manholes, 1 concrete outfall, 72 ft. 48 in. 8 gage and 163 ft. 48 in. 12-gage corrugated pipe, to Reel Contractors, Sidney, $23,819.

N. H., Somersworth—Town, 2½ mi. sewer line, disposal tank, to Ames Constr. Co., Somersworth, $16,800.

N. M., Clayton—Sanitary sewerage system, to Jordon Hall Constr. Co., Plainview, and W. Hale Childress, $118,971.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., sewers in 35th, 36th, 37th, 38th and 39th Sts., to Murphy & Richmond, Inc., 50 Court St., Brooklyn, $166,347. Noted May 14.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir., to P. Pinciotti, 4103 East Roosevelt Blvd., branch sewers in Bigler St. from Adler to Warnock Sts. $911, 4th St. from Oregon to Shunk Sts. $4,159; to V. Jaffolla, Oxford Bldg., Hagerman St. from Hellerman to Levick Sts. $4,097; to Philadelphia Eng. & Constr. Co., North American Bldg., Large St. from Glendale to Hartel Sts. $7,365, 20th St. from Olney St. to Thorps Lane $4,170, Windrim Ave. from Wayne to Germantown Sts. $6,350; to Leva Bros., 104 West Gale St., Merrick St. from Cresson to Dobson Sts. $5,502. Grand total $32,554. Schedule B, sewage disposal project, incl. main gravity intercepting sewer in Mingo Ave. from Penrose Ave. to Mingo Creek, pending. Noted June 4.

R. I., Providence—Bd. Contr. & Supply, sanitary sewers in North Main, Hewes and Stevens Sts., to A. G. D'Uva, 455 Union Ave., Angell, Carolina and Fort Sts., to M. A. Gammino Constr. Co., 728 Valley St., Atlas and Chaucer Sts., to D. Mondillo, 557 Admiral St.; Beaufort, Roanoke, Rangeley, Rockland, Aventtine, Greeley, Opper and King Philip Sts., to I. Capaldi, 270 Mt. Pleasant Ave. Est. exceeds $25,000.

WASTE DISPOSAL

PROPOSED WORK

N. Y., Pelham Manor—Village garbage disposal plant, Good Pl. and West St. To exceed $100,000.

BRIDGES

PROPOSED WORK

Calif., Los Angeles—Bd. Comrs. Los Angeles Co., 2 steel, concrete girder bridges with concrete piers, deck railing, each consisting twelve 40 ft. spans with 54 ft. roadway, 5 ft. sidewalks, one over Los Angeles River at Firestone Blvd., other over Rio Hondo River at Firestone Blvd.; structural redwood or Douglas fir timber bridge, to have three 60 ft. Howe Truss type spans, 30 ft. wide over San Gabriel River, at Carson St. W. D. Armstrong, county bridge engr.

N. J., New Brunswick — Bd. Freeholders Middlesex Co., Court House, steel, concrete bridge over Farrington Lake and Oakleys Brook, $25,000. **Maturity probably in September.** F. Buchanan, Court House, co. engr. Noted May 21.

N. J., Pottersville—Bd. Freeholders Somerset Co., Court House, Somerville, will not build steel, concrete bridge. $25,000. Project abandoned. Noted May 28.

N. J., West Orange—Bd. Freeholders Essex Co., Hall of Records Bldg., Newark, preliminary plans 50 ft. steel, concrete bridges on Mountain Ave. $25,000. W. Stickles, Hall of Record Bldg., Newark, co. engr.

S. D., Buffalo City—Custer Co., S. U. Coe, aud., Custer, 730 ft. steel bridge over Cheyenne River, east of here. $45,000. J. H. Scur, Custer, co. engr.

Okla., Canton — State Hy. Dpt., Oklahoma City, preliminary plans 10 span 140 ft. bridge, Blaine Co. $30,000. A. R. Losh, hy. engr.

Tex., San Benito—Rio Grande del Norte Investment Co., granted permit rein.-con. steel toll bridge over Rio Grande River, near here. $90,000. Private plans.

Washington—Clark Co. (Vancouver) and Cowlitz Co. (Kelso), Vancouver, replacing present timber structure with 300 ft. suspension bridge over Lewis River. $41,000. C. Deako, Vancouver, Clark Co. engr.

BIDS ASKED

Ark., Little Rock—June 30, by Bd. Comrs. Dist. 30, Pulaski Co., 290 ft. flat slab steel span bridge, concrete piers, abutments, 12th St. Pike. $66,000. G. Douglass, Court House, engr.

California—See "Streets and Roads."

Calif., Redding — July 8, by C. H. Purcell, engr., State Hy. Comn., Sacramento, timber bridge to have twenty-two 19 ft. spans on frame bents, concrete pedestals, 23 mi. east of here, Shasta Co.

Calif., San Jose—July 1, by State Hy. Comm., Sacramento, rein.-con. girder bridge, incl. six 34 ft. spans on concrete pile bents, concrete abutments, wing walls on pile founds. over Coyote Creek, Santa Clara Co. C. H. Purcell, hy. engr.

Calif., Visalia—July 6, by G. Stewart, clk. Tulare Co., rein.-con. bridge over White River on hy. between Ducor and Richgrove, incl. 174.63 cu.yd. A, 9.02 cu.yd. F, 31.29 cu.yd. A concrete, 400 cu.yd. earth fill (approaches), constructing detour. Owner furnishes material.

Kansas—July 10, by State Hy. Comm., State House, Ottawa, 5 span 360 ft. bridge, incl. one 120 ft., two 80 ft. two 40 ft. deck girder spans, 156,230 lb. structural steel F.A.P. 293C, Miami Co. W. V. Buck, Topeka, hy. engr.

Michigan—July 2 by H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, Br. 1 of 26-16-20, Contrs. 1 and 2, two 16 ft. and one 35 ft. spans, 2 timber bent abutments, steel deck girder, two 1½ ft. sidewalks, Gladwin Co., for State Hy. Comm., Lansing.

Michigan—July 1, by C. E. Foster, ch. engr. State Hy. Dpt., Lansing, MBr. 1 of 16-11-22, Contr. 11, rein.-con. elevator tower, 35 by 16 ft. and 49 ft. above general dock level, rein.-con. tower to house 2-car electrically operated elevator, Cheboygan Co.

Michigan—July 9, by H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, FBr. 3 of 56-8-2, Contrs. 1 and 2, 2 rein.-con. abutments, steel deck girder with concrete flooring and wearing surface, concrete spindle railing, two 2½ ft. sidewalks, Midland Co., for State Hy. Comm., Lansing.

Michigan—July 8, by H. G. Oakes, div. engr., Plymouth, F.A.Br. 2 of 50-8-1, Contrs. 2 and 3, 2 rein.-con. abutments, steel deck girder, concrete floor wearing surface and concrete spindle railing, two 6 ft. sidewalks; F.A.Br. 3 of 50-8-1 Contrs. 2 and 3, 2 rein.-con. abutments steel deck girder (rolled steel beams), concrete floor, concrete wearing surface and railing, two 6 ft. sidewalks—F.A.Br. 4 of 50-81-1, Contrs. 2 and 3, 2 rein.-con. abutments, steel deck girder, concrete floor, wearing surface and concrete spindle railing, two 6 ft. sidewalks, all foregoing in Macomb Co., for State Hy. Comm., Lansing.

Mich., Mackinaw—Julyl 1, by C. E. Foster, ch. engr. State Hy. Dpt., Lansing, MBr. 1 of 49-8-1 Contr. 2, steel, timber elevator tower, 35 by 16 ft. and 49 ft. high above dock level, removal of piling and timber deck work and dock facing from existing dock, necessary replacement for new tower, constructing steel frame tower.

Mo., St. Louis—St. Louis & San Francisco Ry., F. G. Jonah, ch. engr., Frisco Bldg., St. Louis, bids about Aug. 6, bridge over Southwest Ave. at Ivanhoe Ave. Noted July 17, 1930.

N. J., Newark—July 2, at office Chief Engineer Essex Co. Park Comn., D. L. Kelly, secy., multiple span rein.-con. arch bridge and 6600 lin.ft. concrete revetment walls along 2nd River in Newark and Belleville. A. B. Cohen, 1 Madison Ave., New York, consult. engr.

New York and New Jersey—July 6, by Port of New York Authority, 80-90 8th Ave., New York, toll buildings, flood light towers in Fort Lee, N. J., for George Washington Bridge over Hudson River; adv. E.N.-R. June 25.

New York—July 14, by A. W. Brandt, comr. Hys., Albany, reconstructing bridges in Chenango, Clinton, Franklin, Livingston, Monroe, Orange, Orleans, Schoharie, and Wayne Counties—elimination work in Schuyler and Erie Counties—constructing county store house and county assistants office near Monticello, Sullivan Co.; adv. E.N.-R. June 25.

N. Y., Brooklyn—Dpt. Plant & Structures, Municipal Bldg., New York, bids about Sept. 1, bridge over Gowanus Canal, at Hamilton Ave. To exceed $500,000. Noted Apr. 16.

N. Y., Tonawanda—June 30, by W. G. Hickman, comr. Erie Co., Buffalo, 100 ft. span steel plate girder bridge, 40 ft. roadway over Ellicott Creek, on Delaware Ave. G. Diehl, Ellicott Sq., Buffalo, co. engr. Noted June 11.

Ohio—June 30, by O. W. Merrell, dir. hys., Columbus, one 20 ft. span and one 24 ft. span concrete slab bridges, Sects. "F," "G" and "P" Urbana-Marysville Rd., Champaign Co., $10,312—two 25 ft. span concrete slab bridge, 24 ft. roadway, Sect. "G" Bucyrus-Upper Sandusky Rd., $10,155—two 40 ft. span, concrete beam bridge, Sect. "B-2-b" Plymouth-Bucyrus Rd., 24 ft. roadway, $18,473, both Crawford Co.—three 45 ft. span, concrete beam bridge, Sect. "B" Columbus-Wooster Rd., 44 ft. roadway, two 2½ ft. sidewalks, Franklin Co., $58,867—two 36 ft.

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Bridges (Continued)

span, concrete beam bridge, Sect. "K" Milford-Hillsboro Rd., 24 ft. roadway, approaches, Highland Co., $34,121—68 ft. span concrete beam bridge, Sects. "Y" and "D" Barberton-Greenwich Rd., 24 ft. roadway, Huron Co., $27,550—32 ft. span concrete beam bridge, Sect. "O" Fremont-Castalia Rd., 24 ft. roadway, Sandusky Co., $8,026—75 ft. span steel I-beam bridge, Sect. "H" Columbus-Wooster Rd., 24 ft. roadway, approaches, Wayne Co., $25,255—two 24 ft. end spans and 32 ft. center span concrete slab bridge, Sect. "F-1" Harriettsville-Carlisle Rd., 24 ft. roadway, two 3½ ft. sidewalks, Noble Co., $15,906—new concrete slab floor on bridge, Sect. "H" Hamilton-Cleves Rd., Hamilton Co., $29,455.

O., Cincinnati—June 30, by Comrs. Hamilton Co., 1 span, 80 ft. concrete arch bridge, McKelvey Rd. $29,481. E. A. Gast, Court House, engr.

Virginia—July 7, by State Hy. Dpt., Richmond, widening 130 ft. bridge over Chickahominy River, Project F-260B1, Henrico and Hanover Counties; 32 ft. 6 in. bridge over Stoney Run, Route 31, Project 260B2, Hanover Co. H. G. Shirley, hy. comr.

CONTRACTS AWARDED

California — State Hy. Comn., Sacramento, four 40 ft. span rein.-con. girder bridge over San Marcos Creek, also grading approaches, 7 mi. north of Paso Robles, San Luis Obispo Co., to L. C. Clark & C. E. Doughty, Visalia, $20,116. Noted May 21.

California—C. H. Purcell, engr. State Hy. Comn., Sacramento, nine 38 to 380 ft. timber bridges, widening 2 concrete bridges, 34 ft. roadway, between Turner Station and Stockton, San Joaquin Co., to Thermotite Constr. Co., San Jose, $57,537. Noted May 28.

Indiana—State Hy. Comn., Indianapolis, 2 rein.-con. arch bridges, one 60 ft., other 80 ft., Howard Co., to E. R. Campbell, Sandborn, $35,241. Noted Jan. 15.

Indiana—State Hy. Comn., Indianapolis, three 84 ft. span steel truss bridge over Big Raccoon Creek, Rd. 36, to Indiana Road Paving Co., Rochester, $31,943 est. $43,292—1 span 60 ft. rein.-con. arch bridge over Williams Creek, Rd. 36, to E. Garrard, Montezuma, $9,849 est. $13,847, both Parke Co.—1 span 40 ft. rein.-con. arch bridge over Moccasin Creek, Rd. 36 Putnam Co., to J. A. Crosbie, Bluffton, $8,260 est. $10,920—1 span 28 ft. rein.-con. girder bridge over Morris Drain, Rd. 43 La Porte Co., to M. J. Clark, East Chicago, $4,725 est. $6,923—1 span 36 ft. rein.-con. girder bridge over Purdy Marsh Ditch, Rd. 67 Knox Co., to A. G. Steel, Bloomfield, $6,567 est. $8,467. Grand total $61,344. Noted May 21.

Ind., Decatur—Adams Co., Schenmann Bridge over St. Marys River, to P. B. Putman, 2222 Kensington St., Ft. Wayne, $23,836. Est. $30,000. Noted July 31.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, double span arch bridge over Paint Branch, Riverdale, incl. all fill surfacing, Contr. P-143-35, Prince George Co., to J. A. and F. M. Wagman, Dallastown, Pa., $16,839. Noted Feb. 26.

Massachusetts—See "Streets and Roads."

Mass., Chicopee—City, F. P. Cobb, engr. 3 span, 315 ft. rein.-con. bridge over Chicopee River, to Fred T. Ley Co., 1215 Main St., Springfield, $195,120. Est. $175,000. Noted June 4.

Missouri—State Hy. Bd., Jefferson City, to Campbell, Davis & Schultze, Troy, bridges over Creek, Madison Co. $1,226; over branch, Madison Co. $1,331—to Carte-Harlin Constr. Co., West Plains, over branch Crooked Creek, $1,848; over Creek, Route 51, to Marquand Rd., R. S. A., Sect. 1, $1,683; over creek, same road, Sect. 2 $858, all foregoing Bollinger Co.; bridges on Washington Co.—Route 32 Rd., St. Francois Co. $5,525; over Whitleney Creek, Madison Co. $2,301—to Glenn E. Stonner, Charleston, over Happy Hollow, $2,273; over Dry Wash, $2,230; over Brushy Creek, $7,115, all foregoing Texas Co.—to J. Kesl & Sons, Edwardsville, Ill., over Drainage Ditch, $6,658; over drainage ditch, $3,916; over Main D. D., Dist. 7, $4,383; over Lateral D. D. 3, $3,775—to Harrison Eng. & Constr. Corp., 506 Mutual Bldg., Kansas City, over Town Branch, $2,459; over Middle River, $6,944; over drainage ditch, $4,307, all foregoing Callaway Co.—to G. W. Condon, 223 Grain Exch. Bldg., Omaha, Neb., over Watkins Creek, $16,123; over Chicago, Burlington & Quincy R.R. Tracks, $19,117, both St. Louis Co.—to M. Wunderlich, 734 Snell Ave., St. Paul, Minn., on Memphis-Kakoka Rd., $15,942; over Honey Creek, $4,358; both Clark Co.; over Niagara River, Dallas Co. $36,237; over Goodwin Hollow, Laclede Co. $11,788; over South Waconda River, Sta. 1089.00, $6,162; over same river Sta. 1102-72, $21,104, both Scotland Co.—to Pittsburgh Des Moines Steel Co., Tuttle and Southwest 10th Sts., Des Moines, Ia., over Sweet Springs Creek, $10,389; over branch $2,220; over Silver Creek, $13,771, all foregoing Randolph Co. — to Firmin T. O'Dell, Hannibal, over Fiddle Creek, Franklin Co. $3,160—to L. Penzel, Jackson, over Missouri Pacific R.R. tracks, Washington Co. $7,910—to C. N. Lund, 815a Chestnut St., St. Louis, over Hackman Creek, St. Louis Co. $4,331—to Independent Constr. Co., Pittsburg, Kan., over Ravine Creek, Vernon Co. $3,535—to Jewett & Hurdy, Shelbina, over Dog Creek, Daviess Co. $3,516—to W. C. Meneely, Clayton, on Bowling Green Rd., Pike Co. $9,330—to Chaney & Amyx, Branson, over Whitestone Creek, Wright Co.

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$812—to Lahar Constr. Co., Boonville, over Main Ditch, Pemiscot Co. $4,668—to L. W. Spangler Constr. Co., Kansas City, over Salt Fork Creek, Lafayette Co. $10,726. Grand total $264,031. Noted May 21.

N. J., Somerville—Bd. Freeholders Somerset Co. (Somerville) and Union Co. (Elizabeth) double span I-beam bridge over Green Brook at Raymond Ave., to Richard & Waston, 110 South Bridge St., Somerville. Est. $25,000.

N. Y., Brooklyn—A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, Metropolitan Ave. Bridge over English Kills, Brooklyn Boro, to E. O. Roberts Co., Inc., 52 Vanderbilt Ave., New York, $477,000. Noted June 4.

N. C., Goldsboro — Wayne Co., c/o County Comn., concrete bridge over Neuse River, at Broadhurst Crossing, near here, to Kiker & Young, Reidsville, $26,504.

Okla., Ayelsworth—State Hy. Dpt., Oklahoma City, 2 span 169 ft. steel truss bridge on concrete piers, Marshall Co., near here, to W. R. Montgomery, Ardmore, $30,723. Est. $35,000.

Ohio—O. W. Merrell, dir. hys., Columbus, 110 ft. span, concrete arch bridge, 30 ft. roadway, over Ashtabula River, Ashtabula Co., to C. L. Moore, Shaker Heights, $29,561; 180 ft. concrete arch bridge over Bean Creek, 1 mi. west of Burlington, State Rt. 107, West Unity-Montpelier Rd., Fulton Co., to Frank Herge, Inc., Malinta, $26,718. Noted June 18.

O., Canton—Comrs. Stark Co., concrete, steel bridge, Mahoning Rd., to E. J. Landor, Eng. & Contg. Co., Renkert Bldg., $25,759. Est. $25,000. Noted May 28.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, Grade Crossing Div., City Hall Annex, A. Murdock, dir., reconstructing bridge in line with Gowen Ave. over Chestnut Hill R.R., constructing retaining walls, laying watermains, curbing, paving, repaving, sidewalks, repaving Gowen Ave., to G. F. Dobbins, 1020 South 47th St., $31,000.

Tex., New Braunfels—Comal Co., c/o Judge, 3 span 165 ft. rein.-con. rigid frame bridge over Comal River, to A. C. Moeller, New Braunfels, $26,000, incl. extras. Noted May 28.

West Virginia—State Hy. Comn., Charleston, substructure Lost River Bridge 1262, Hardy Co., to Hoynes Bros., Russellville, $5,580—superstructure same bridge, to Fairmont Mining Mchy. Co., Fairmont, $8,601—substructure Man Bridge 1234, Logan Co., to J. M. Francesco, Fayetteville, $8,388 — superstructure same bridge, to Bristol Steel & Iron Wks., Bristol, $14,500—substructure and superstructure Timmons Bridge 1276, Mercer Co., to Monty Bros., Charleston, $14,704. Grand total $51,773.

STREETS AND ROADS

BIDS ASKED

Arkansas—July 2, by State Hy. Comn., Little Rock, grading, drainage structures, bituminous concrete on gravel surfacing 13 mi. Job 678, Route 65, Sect. 10 from Conway south, Faulkner Co., 30 ft., $250,000; grading, drainage structures, concrete surfacing 2 mi. Job 11,000, Route 20, Sect. 3 from Helena to West Helena, 26 ft., Phillips Co., $60,000. C. S. Christian, hy. engr.

Ark., Fort Smith—July 2, by City Comr., grading, curbing, guttering, storm sewers South M and South N Sts., Dist. 46, $11,000; North A, North B, North C, North 2nd and North 6th Sts., Dist. 47, $69,000. W. L. Winters, 311 Merchants Bank Bldg., engr.

California — June 30, by Division Engineer State Hy. Comn., Dist. 10, Sacramento, bituminous treated crushed gravel or stone surfacing 2.8 mi. road between point 1.4 mi. north and point 1.4 mi. south of Calaveritas Creek, Calaveras Co.

California—July 1, by C. H. Purcell, engr. State Hy. Comn., Sacramento, oil treated crushed gravel or stone border surfacing 43.2 mi. road between Dixieland and Holtville, and between El Centro and point 4 mi. west of Westmoreland, Imperial Co.; grading, oil treated crushed gravel or stone surfacing 23.7 mi. road between point 6 mi. west of Baker and Halloran Summit, San Bernardino Co.

California—July 8, by Bd. Directors Joint Hy. Dist. 15, at Santa Ana, improving Sect. F-Ortega Hy., incl. 478 sta. clearing and grubbing, 355,000 cu.yd. excav., 281,000 sta.yd. overhaul (500 ft. free haul), corrugated metal pipe, Riverside and Orange Counties.

California—July 8, by C. H. Purcell, engr. State Hy. Comn., Sacramento, selected material surfacing 4.3 mi., oil surfacing 7.5 mi. road between Doyle and Long Valley Creek, Lassen Co.—gravel surfacing 6.6 mi. road between point 12 mi. and 5 mi. west of Williams, Colusa Co.—grading, untreated crushed gravel or stone surfacing 2.9 mi. road between Westerly Boundary and Toll House, Nevada Co.—bituminous treated crushed gravel or stone surfacing (plant mix) 9.1 mi. road between Colfax and Gold Run, Placer Co.—furnishing, applying heavy fuel oil on 33.9 mi. road between La Mesa and La Posta Creek, San Diego Co.

California—July 15, by C. H. Purcell, engr. State Hy. Comn., Sacramento, bituminous treated crushed gravel or stone (road mix) surfacing 8.6 mi. Riverton-Kyburg Rd., El dorado Co.—bituminous treated seelcted surfacing material 5.2 mi. road between Mays and Nevada State line—bituminous treated surfacing 1.8 mi. road between Bay View Rest and point 1 mi. north of Eagle Falls, both Eldorado Co.—concrete and asphaltic concrete surfacing 1.4 mi. Coyote Creek-San Jose Rd., Santa Clara Co.—grading 7.4 mi. Orange Hill School-Pain Flat Rd., Mariposa Co.—12.5 mi. Piru Creek-Gorman Rd., Los Angeles Co.—undergrade crossing, incl. 2 concrete abutments with wing walls, under Southern Pacific R.R. near ElRio, also drainage system, pumping equipment, grading, concrete and bituminous macadam paving, 0.33 mi. roadway, Ventura Co.

Calif., Fresno — July 3, by D. M. Barnwell, clk. Fresno Co., paving Mt. Whitney Ave., incl. 1,800 tons Jensenite or Permanite pavement.

Calif., Pinole—July 6, by Clerk Contra Costa Co., Martinez, improving Tennet Ave., incl. 2,385 cu.yd. excav., 2,067 tons base rock, 208 ton No. 4 screenings, 347 tons pea gravel, 10,380 gal. emulsified asphalt in place, 3,462 gal. road oil to be placed.

Calif., Riverside — July 6, by Bd. Supervs. Riverside Co., improving B St., in West Riverside, incl. 7,950 lin.ft. shaping roadway, 2,988 cu.yd. excav., 3,165 cu.yd. Class A concrete. Alternate A, 6,182 tons asphaltic concrete. Alternate B, 195,000 sq.ft. 3 in. macadam surfacing.

Delaware—July 9, by State Hy. Dpt., Dover, clearing, grubbing, grading, Class A concrete paving 5.52 mi. Pearson's Corner-Moore's Corner, Contr. 156—6.37 mi. Primehook Neck Rd., Contr. 193—gravel surfacing 2,000 cu.yd. National Guard Camp, Contr. 196—grading, gravel surfacing 1 mi. Cotton Patch Hills-Indian River Inlet, Contr. 197—grading, concrete sidewalks, 6,000 sq.ft. Georgetown Sidewalks, Contr. 198—adv. E.N.-R. June 25.

Indiana—June 30, by State Hy. Comn., Indianapolis, rock asphalt, bituminous concrete or asphaltic macadam surfacing 5.719 mi. State Rd. 27 from Portland to point south of Bryant, Contr. 140, F.A.P. 270, Jay Co.—8.2 mi. State Rd. 56, west from Jasper, Contr. 146, F.A.P. 27A, Sect. B, Dubois Co.—9.324 mi. State Rd. 50 west from Pike-Dubois Co. line Rd., Contr. 147, F.A.P. 279-A, Pike Co.—2.452 mi. State Rd. 31 east to junction Roads 31 and 50, Contr. 151, Jackson Co.—2.375 mi. State Rd. 27, Contr. 153 from point 5.01 mi. north of Berne, Adams Co. J. J. Brown, dir.

Indiana — June 30, by State Hy. Comn., Indianapolis, asphaltic macadam, bituminous concrete, rock asphalt, or concrete surfacing 4.279 mi. Federal Aid Project 120-B, Contr. 139, State Rd. 52 from Rushville southeast, Rush Co.—asphaltic macadam, bituminous concrete or rock asphalt surfacing 2.195 mi. Federal Aid Project 130-D, State Project 275, Contr. 141-A, State Rd. 67, Delaware Co.—1.763 mi. Federal Aid Project 83-C, Contr. 141-B, State Rd. 9, Madison Co. J. J. Brown, dir.

Ind., Bloomfield—July 7, by Bd. Comrs. Greene Co., macadam surfacing Shields and Gibson Rds. $30,000. H. Rollison, Bloomfield, co. aud.

Ind., Brazil—July 7, by Bd. Comrs. Clay Co., concrete surfacing James Adams Rd. $26,877. L. Shopmeyer, Brazil, co. aud.

Ind., Columbia City—July 7, by Bd. Comrs. Whitley Co., gravel surfacing C. I. Thomas Rd. $35,140. E. Cotterly, Columbia City, co. aud.

Ind., Columbia City—July 7, by Bd. Comrs. Whitley Co., concrete surfacing 13,592 ft. A. Copperrider Rd., $15,679—11,400 ft. R. W. Wigent Rd., $15,356—13,807 ft. F. M. Glass Rd., $7,845. E. Cotterly, Columbia City, co. aud.

Ind., Decatur—July 7, by Bd. Comrs. Adams Co., concrete surfacing Bernstein Rd., $28,974. A. Harlow, Decatur, co. aud.

Ind., Indianapolis—June 29, by Bd. P. Wks., City Hall, removing old paving, and curbing, guttering, widening, 3 in. asphalt on present concrete repaving New York St. $125,000.

Ind., La Porte—July 6, by Bd. Comrs. La Porte Co., concrete surfacing E. Grieger Rd., $19,420; James Cullen Rd., $29,000. R. W. Leets, La Porte, co. aud.

Iowa—June 30, at office R. R. Zack, dist. engr., State Hy. Comn., Globe Gazette Bldg., 121½ East State St., Mason City, crushed gravel surfacing M-214, incl. 7,700 cu.yd. gravel 1 mi. haul, 67,350 units overhaul, 2,600 cu.yd. stripping, Hardin Co.—M-215, 725 cu.yd. gravel 1 mi. haul, 5,970 units overhaul, 150 cu.yd. stripping, Winnebago Co.—M-216, 3,000 cu.yd. 1 mi. haul, 32,465 units overhaul, 900 cu.yd. stripping, Mitchell Co.—M-217, 2,200 cu.yd. 1 mi. haul, 41,315 units overhaul, 400 cu.yd. stripping, 1,200 cu.yd. gravel complete on road, Chickasaw Co.—M-218, 1,000 cu.yd. 1 mi. haul, 14,715 units overhaul, 200 cu.yd. stripping, Butler Co.—M-219, 2,125 cu.yd. 1 mi. haul, 39,315 units overhaul, 600 cu.yd. stripping, Floyd Co.—M-220, 4,025 cu.yd. crushed, 1 mi. haul, 575 cu.yd. screened, 1 mi. haul, 36,000 units overhaul, Worth Co.—M-221, 2,050 cu.yd. 1 mi. haul, 57,350 units overhaul, 600 cu.yd. stripping, Howard Co.

Ia., Decorah—July 7, at office Auditor Winneshiek Co., gravel or crushed stone surfacing 9.5 mi. local roads, also seasons supply corrugated culverts.

Ia., Ida Grove—June 30, at office Auditor Ida Co., grading, incidental work 3.57 mi. trunk roads, south of Battle Creek—5.03 mi. local roads in Douglas Twp.—also constructing 6 rein.-con. box culverts.

Ia., Sac City—June 30, at office Auditor Sac Co., gravel surfacing 31.5 mi. local roads; maintenance graveling 11,000 cu.yd. roads. B. D. Jones, Sac City, co. engr.

Streets and Roads (Continued)

Kansas—July 10, by State Hy. Comn., Court House, Ottawa, grading, drainage structures, concrete surfacing 1.078 mi. Kansas Project 7, Federal Aid Project 293-C, Miami Co.; 6.461 mi. Kansas Project 33, Federal Aid Project 352-C, Franklin Co., both 20 ft. W. V. Buck, Topeka, hy. engr.

Kan., St. Francis—July 1, by City, F. L. Shields, clk., curbing, guttering, grading, miscellaneous work, 2½ in. brick, asphalt filler, 1 in. sand cushion, 5 in. concrete base 1:6 sand and gravel mix, or 1 in. Utah Rock asphalt on 6 in. concrete, 1:5 sand and gravel mix, or 7 in. concrete, 40 lb. reinforced, 1:4 sand and gravel mix, or 7 in. vibrolithic concrete armorplate, 1:4 sand and gravel mix paving 18,800 sq.yd. E. T. Archer & Co., New England Bldg., Kansas City, Mo., engrs.

Louisiana — July 14, by State Hy. Comn., Baton Rouge, concrete surfacing 3.22 mi. Ringold Rd. east and west—2.11 mi. Arcadia Rd. north and south, both Bienville Parish—4.7 mi. road between Logansport and Longstreet—3.1 mi. road between Mansfield and Sodus, both De Soto Co.—11.326 mi. road between Caddo Parish line and Grand Bayou—22.221 mi. road between Grand Rapids Bayou and Hanna, both Red River Parish—3.5 mi. road north and south through Sodus, Sabine Parish—asphaltic surfacing 0.78 mi. road between Lake Charles and Sulphur, Calcasieu Parish—1.1 mi. approaches to Industrial Canal Bridge, Orleans Parish—22 mi. St. Martinsville Rd., St. Martin Parish—14 mi. road between Covington and Bush, St. Tammany Parish—grading, drainage structures 11.6 mi. road between Eunice and Basile—14.7 mi. road from Livonia through Krotz Springs, both St. Landry Parish—gravel surfacing 4 mi. Ashland-Red River Hy., Natchitoches Parish — 8.4 mi. road, between Pleasant Hill and Lake Enid, De Soto and Natchitoches Parishes—8.4 mi. road between Kelly and Sikes, Caldwell Parish—4.534 mi. road between Guicefield and Nickel, Catahoula Parish—7 mi. road between Kilbourne and Concord, West Carroll Parish—9.7 mi. road between Start and Columbia, Richland Parish—7 mi. road between Dry Creek and intersection with Route 22, Beauregard Parish—6 mi. road between Washington and intersection with Route 214, St. Landry Parish—8 mi. road between Mamou and Chataignier, Evangeline Parish—6.1 mi. road between Doyle and Springville, Livingston Parish—7.6 mi. hy. between Marion and Huttig, Union Parish—7.2 mi. hy. between Liddieville and Alto, Richland and Franklin Parishes—5.9 mi. road between Blue Prairie and Ronds, Evangeline Parish—7.1 mi. hy. between Start and Columbia, Richland and Caldwell Parishes—shell surfacing 7.1 mi. hy. between Bourg and La Rose, Terrebonne Parish—6.648 mi. hy. between Erath and Intercostal, Vermilion Parish—gravel or shell surfacing 3.7 mi. hy. between Bayou Goula and Forest Home, Iberville Parish—shell sub-grade treating 10.7 mi. hy. between Norco and Kenner, Jefferson and St. Charles Parishes. H. B. Henderlite, hy. engr.

Maryland—June 30, by State Roads Comn., Baltimore, L. H. Steuart, secy., sheet asphalt paving 0.58 mi. Contr. BC-106-74, Baltimore City—gravel surfacing 2.5 mi. Contr. C-46-84—2.08 mi. Contr. C-48-84, both Calvert Co.—concrete paving 4.83 mi. Contr. Co-70-22, Caroline Co.; adv. E.N.-R. June 25.

Md., Easton—July 1, by Mayor and Council, concrete paving 1,500 sq.yd. South St. E. G. Kastenhuber, Jr., town engr.

Mass., Boston—June 26, by Park Dpt., 33 Beacon St., sheet asphalt or bitulithic paving Arborway. $30,000.

Mass., Marlboro—See "Contracts Awarded."

Michigan—July 2, by H. G. Oakes, div. engr., Plymouth, shaping, widening, concrete paving 2.412 mi. FO33-24C-8, MO33-24C-9 and MO19-22C-5, Ingham and Clinton Counties, for State Hy. Comn., Lansing.

Michigan—July 7, by W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, grading, shaping, drainage structures, concrete paving 0.431 mi. MO70-33C-1, Ottawa Co., for State Hy. Comn., Lansing.

Michigan—July 8, by H. W. Hagaman, div. engr., 208 Kresge Bldg., Port Huron, grading, shaping, drainage structures, concrete paving 5.424 mi. FO79-36C-1, Tuscola Co., for State Hy. Comn., Lansing.

Miss., Yazoo City—July 6, by Bd. Supervs. Yazoo Co., repairing Lake City, Short Creek, Judkins, Free Run Rds., incl. 4,500 cu.yd. gravel surfacing.

Miss., Yazoo City—D. M. Love, mayor, and City Council, rejected bids June 9, grading, curbing, guttering, sewers, sidewalks, paving 50,000 sq.yd. Address City Engineer.

New Hampshire—July 2, by State Hy. Dpt., Concord, 3 in gravel on 6 in. gravel base course surfacing 3,955 cu.yd. Theodore Roosevelt Hy., Conway, $13,000; 6 in. one course rein.-con. on 8 in. gravel base course surfacing 21,994 sq.yd. East Side Rd., Dover, $50,000.

N. J., East Orange—July 13, by City Council, City Hall, sheet asphalt, 2 in. National or 2 in. warrenite bitulithic on old telford base paving 7,000 sq.yd. Brighton Ave. from Burchard Ave. to Dodd St. $25,000. E. Willigerod, city engr.

N. J., East Orange—July 13, by City Council, City Hall, sheet asphalt, 2 in. National or 2 in. warrenite bitulithic on 6 in. portland concrete paving 9,000 sq.yd. Melmore Garden extension. $25,000. E. Willegerod, city engr.

N. Y., New York—June 24, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading, curbing, sidewalks, bituminous concrete on concrete paving Nereid Ave.—grading, curbing, sheet asphalt on concrete paving East 163rd St., Fowler, Tenbroeck, Holland and Longfellow Aves.—grading, curbing, sidewalks on West 232nd St.

N. Y., Buffalo—July 2, by W. Rathman, comr. P. Wks., repaving Forest Ave., Edwin Pl., and Harbor Turnpike.

N. Y., New York—June 30, by S. Levy, pres. Manhattan Boro, Municipal Bldg., sheet asphalt on concrete paving West 143rd and W. 28th Sts.; granite block on concrete repaving East 100th St.

N. Y., St. George—See "Sewers."

Ohio—June 30, by O. W. Merrell, dir. hys., Columbus, improving hys. and paving with (a) brick, incl. furnishing, delivering brick (b) bituminous macadam (c) concrete (d) tar macadam (e) sheet asphalt (f) rock asphalt (g) rein.-con. (h) asphalt resurfacing, relaying brick, etc., (i) gravel, crushed stone, or slag surfacing (j) brick; 1.75 mi. Sects. "R" and "S" Ohio River Rd., Brown Co. (a) $55,203 (c) $32,644—5.505 mi. Sects. "A" and "D" Hamilton-Middletown Rd., Butler Co. (b) $180,620—5.282 mi. Sect. "Q" Cincinnati-Zanesville Rd., Clinton Co. (c) $105,927 (d) $115,774—2.854 mi. Sect. "G-1" Cleveland-Wooster Rd., (a) $387,512 (e) $338,857 (c) $281,122—1.946 mi. Sect. "Parma" Cleveland-Wooster Rd., (a) $258,895—1.477 mi. Sect. "Olmstead Falls" Mallet Creek-Bay Village Rd. (a) $99,073, (c) $69,493 (e) $86,897, all foregoing in Cuyahoga Co.—8.514 mi. Sect. "L" Columbus-Sandusky Rd., Delaware Co. (a) $316,777 (d) $222,222 (f) $226,787 (g) $244,373—1.093 mi. Sect. "I" Toledo-Angola Rd., Fulton Co., (b) $31,858 (c) $29,796—3.087 mi. Sects. "F," "G" and "H" Cambridge-Steubenville Rd., Guernsey Co. (a) $150,762 (b) $119,720 (c) $109,320—0.312 mi. Sect. "A" Cincinnati-Hamilton Rd., Hamilton Co. (c) $17,317—0.99 mi. Sect. "Leesburg East" Cincinnati-Chillicothe Rd., (c) $4,011 (j) $5,485—0.469 mi. Sect. "L" Lynchburg, Wilmington-Sardinia Rd. (a) $19,750 (c) $14,103, both Highland Co.—4.27 mi. Sects. "Y" and "D" Barberton-Greenwich Rd., Huron Co. (c) $102,905—0.375 mi. Sect. "I" Toledo-Wauseon Rd., Lucas Co. (a) $36,077 (c) $27,375—0.128 mi. Sect. "Frezeysburg" Newark-Coshocton Rd., Muskingum Co. (b) $4,035 (c) $2,012 (j) $4,720—0.969 mi. Sect. "B" Port Clinton-Bay Ridge Rd., Ottawa Co. (b) $27,432 (c) $25,502—5.701 mi. Sect. "F" Eaton-Richmond Rd., Noble Co. (b) $134,156 (c) $130,435—1,338 mi. Sect. "Chillicothe" Portsmouth-Columbus and other roads, Ross Co. (h) $72,773—1.876 mi. Sect. "G" Delaware-London Rd., Union Co. (b) $63,932 (c) $61,680—0.486 mi. Sect. "J" Massillon-Wooster Rd., Wayne Co. (i) $40,611—5.2087 mi. Sect. "A-2" and others, Toledo-Angola Rd., Williams Co. (b) $166,575 (c) $148,271—2.885 mi. Sect. "E" Perrysburg-Fostoria Rd., Wood Co. (b) $97,648, (c) $96,606.

Ohio—July 7, by O. W. Merrell, dir. hys., Columbus, tar macadam resurfacing 400 mi. hys. in Fulton, Williams, Brown, Madison, Pickaway, Lake, Paulding, Wyandot, Hardin, Clark, Stark, Portage, Guernsey, Trumbull, Ashland Crawford, Huron, Harrison, Belmont, Montgomery, Greene, Shelby, Champaign, Logan, Clinton, Warren, Mercer, Van Wert, Jackson, Highland, Ottawa, Wood, Lucas, Henry, Marion and Lawrence Counties. $400,000.

O., Columbus—July 8, by Comrs. Franklin Co., F. L. Donnally, clk., widening, 4 in. bituminous macadam surfacing 1.86 mi. road, 20 ft. $32,597. C. C. Lattimer, Court House, engr.

O., New Philadelphia — June 30, by City Council, 7½ ft. widening, sheet asphalt on concrete paving 2 blocks 4th St. N. W. G. Arnold, city engr.

Pa., Kittanning — July 6, by H. J. Walter, boro secy., grading, drainage structures, 8 in. rein.-con. paving North McKean, North and South Jefferson Sts. $25,000. W. G. Aye, 310 Market St., engr.

Pa., Pittsburgh—June 26, by E. G. Lang, City County Bldg., grading, curbing, paving Negley Ave. and Spring St., $32,000—Lilac St., 4th and Shady Aves., Kaufman and Sinnet Ways, $60,000—McIntyre and Owendale Aves., $27,800—Marlow St., $41,000—Black, Delmont and Hailman Sts., $28,100—Album and Amanda Sts., $28,000. C. M. Reppert, City County Bldg., engrs.

Tex., Galveston—July 7, by Galveston Co., I. Predecki, aud., single course bituminous surfacing 18.22 mi. League City-Friendswood, Texas City-La Marque, and Dickinson-Alta Loma Rds.

Utah—July 1, by State Hy. Comn., Salt Lake City, grading, graveling 42,500 cu.yd. Midland Trail from Price to Carbon-Emery Co. line, Carbon Co. H. S. Kerr, Salt Lake City, state hy. engr.

Washington—July 7, by S. J. Humes, dir. Hys., Olympia, grading, draining, crushed rock surfacing 2.3 mi. State Rd. 6, Metaline to Metaline Falls, Pend Oreille Co.—0.6 mi. Skinville Cut-Off, Pacific Co.—1.6 mi. Methow Valley Hy. Twisp Extension, Okanogan Co.—reconstructing bituminous surfacing and bituminous seal coat 64 mi. State Rd. 2k North Bend to Virden, King and Kittitas Counties — 30 mi. State Rd. 7, Ellensburg to Vantage, Kittitas Co. 16 mi. road from Colfax to Pullman, 17 mi. road from Dusty to Central Ferry, 50 mi. Inland Empire Hy. Eastern Div., Oaksdale to Colton—8 mi. Inland Empire Hy. Eastern Division, Colton to Idaho State Line, all in Whitman Co.—24 mi. State Rd. 2, Longview to Cathlamet, Cowlitz and Wahkiakum Counties — 14 mi. Beam Rd. to Francis and 13 mi. Francis to Kramer's Crossing, Lewis and Pacific Counties.

Wash., Everett—Comrs. Snohomish Co. bids about Aug. 6, widening 3 mi. roadway to connect with Pacific Hy. $25,000. R. D. Alverson, Everett, co. engr.

Wash., Kelso—June 30, by comrs. Cowlitz Co., constructing 2.3 mi. Hy. 3, west side Cowlitz River. $45,000. F. C. Cramer, Kelso, engr.

Wash., Kelso—Comrs. Cowlitz Co., bids about July 16, graveling Lateral Hy. 4. $45,000. F. C. Cramer, Kelso, engr.

Wash., Port Angeles — July 2, by Comrs. Callam Co., bituminous macadam paving 12 mi. hy. from Port Angeles to Joyce. $72,000. F. Sullivan, Port Angeles, co. engr.

Wisconsin—June 30, by State Hy. Comn. and Hy. Cons. Trempealeau and Vernon Counties, Court House, La Crosse, grading 105,878 cu.yd. Independence-Eleva Rd., S.T.H. 93, S.A.P. 5297, incl. Sakrison, Langhaugh, Missell Bridges, Melness Culvert, and cattle passes on same road; grading, crushed stone surfacing 5,364 cu.yd. De Soto-Viroqua Rd., S.T.H. 83, S.A.P. 6307—3.066 mi. LaFarge-Viroque Rd., S.T.H. 56 and 82, incl. Getter, Groves, Turner, School House and Yttri Bridges.

Ont., Brockville—See "Contracts Awarded."

Ont., Fort William—See "Contracts Awarded."

Ont., Merritton—Council bids early in July, concrete paving Merritt, Oak and Elm Sts. $30,000. A. McPhail, Town Hall, engr.

Ont., Sarnia—June 29, by W. B. Beatty, city engr., asphalt paving 16,500 sq.yd. Russell St., $40,000; paving space formerly occupied by street car tracks on Wellington St., $14,000.

CONTRACTS AWARDED

California—State Hy. Comn., Sacramento, bituminous surface treating 7 mi. Pacific Hy., 20 ft., Siskiyou Co., to Heafey-Moore Co., 344 High St., Oakland, $25,702.

California—E. E. Wallace, dist. engr. State Hy. Comn., Sacramento, bituminous surface treating (asphalt road oil and screenings) 12.5 mi. road between El Portal and Lorenes on Briceburg Grade, Mariposa Co., to A. Teichert & Son., Inc., 1846 37th St., Sacramento, $14,646.

California — State Hy. Comn., Sacramento, heavy fuel oil 8 ft. wide on each side existing pavement 10.1 mi. road from Chualar to Salinas, Monterey Co., to C. W. Wood, Stockton, $15,105; heavy fuel oil and cut-back asphalt as dust palliative 60.1 mi. hy. between Redding and Fall River, Shasta Co., to D. McDonald, 1118 G St., Sacramento, $13,154.

California—C. H. Purcell, engr. State Hy. Comn., Sacramento, concrete paving 8.6 mi. road, 20 ft., Colusa Co., to Union Paving Co., Call Bldg., San Francisco, $230,247—heavy fuel oil surfacing 2 mi. road, 18 and 20 ft., Mono Co., to Basalt Rock Co., Napa, $24,364—heavy fuel oil surfacing 37.8 mi. shoulders, 3 ft., Merced Co., to Stewart & Nuss Co., Inc., 400 Throne St., Fresno, $12,756. Est. $267,367. Noted May 28.

Calif., Antioch—J. E. McElehny, city clk., grading, sewers, 5 in. concrete paving 145,000 sq.ft. streets in Wills Addition, to C. H. Brown, 220 South 12th St., Richmond, $46,350. Noted May 28.

Calif., Hanford—Kings Co., improving roads, incl. 63,535 lin.ft. grading for shoulder work, 480 tons asphaltic base on curves, 7,375 tons base level course materials, 13,985 tons asphaltic concrete top, to Thompson Bros., 2150 G St., Fresno, $74,535.

Calif., Long Beach—City Council, grading, 6 in. asphaltic concrete paving 253,000 sq.ft. Magnolia St. between State and Willow Sts., to Griffith Co., Railway Bldg., Los Angeles, $49,135.

Calif., San Jose—Santa Clara Co., macadamizing Curtner Ave., et al., to San Jose Paving Co., San Carlos and Dupont Sts., $23,683.

Calif., San Rafael—R. E. Graham, clk. Marin Co., grading, drainage structures, bridging 4.3 mi. Millerton-Marshall Rd., to J. V. Galbraith, Petaluma, $34,017. Noted June 4.

Idaho—Commissioner P. Wks., Boise, crushed graveling 24.093 mi. Power and Cassia Counties, to S. H. Newell & Co., 1254 Reed College Pl., Portland, Ore., $44,950 est. $60,042; 10.652 mi. Roosevelt Hy., to Robinson Constr. Co., Twin Falls, $114,934 est. $120,386. Noted May 29.

Idaho—A. Harbour, comr. P. Wks., Boise, crushed graveling 3.998 mi. Lost River Hy., to Idaho Contr. Co., Boise, $44,383. Est. $49,454. Noted May 7.

Ill., Aledo—Mercer Co., concrete surfacing 4.189 mi. Sect. 2-15D, to Central Eng. Co., 809 Putnam Bldg., Davenport, Ia., $44,226. Noted June 4.

Ill., Belleville — Bd. Comrs. St. Clair Co. grading 1.2906 mi. Sect. 81A-15d, 32 ft., to Tritt Bros., 17A North Illinois St., $9,400; concrete paving 3.5549 mi. Sect. 83-15d, 20 ft., to Moore Bros. Constr. Co., 2000 St. Clair Ave., East St. Louis, $92,500. Noted June 4.

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Streets and Roads (Continued)

Ill., Benton—Franklin Co., 4 in. gravel and oil subgrade surfacing 3.057 mi. State Aid Route 9, Sect. 4 MFT, 18 ft., to W. H. Laird, Ewing, $29,670.

Ill., Carlyle—Clinton Co., concrete surfacing 0.5521 mi. Sect. 1—X, and 1.8532 mi. Sect. 1—Y, both 9 ft. with 6 and 16 ft. shoulders, to Stocker Gravel & Constr. Co., Highland, $25,007. Owner furnishes cement.

Ill., Dixon—Lee Co., concrete surfacing 2.8 mi. Sect. 1-MFT, 18 ft., to H. Zalpher & Sons, Mendota, $32,329. Noted June 4.

Ill., Fairview—E. F. Motsinger, engr., City Hall, rein.-con. paving 2,600 ft. Fairview Paving Dist., 18 and 37 ft., to Moline Paving & Constr. Co., Moline, $14,440. Noted Jan. 22.

Ill., Peoria—Peoria Co., concrete surfacing 4.3703 mi. Sect. Z-E 15d, 18 ft., to Jansen & Schaefer, Pekin, $90,911.

Ill., Salem—Bd. Comrs. Marion Co., traffic bound surface course surfacing 1.8924 mi. Sect. 2-MFT and 4.0653 mi. Sect. 2W-MFT, State Aid Route 5, 18 ft., to J. W. Etchison, Casey, $36,750.

Ill., Taylorville—Christian Co., concrete surfacing 3.2804 mi. Sect. 2-MFT and 19 corrugated metal pipe culverts, Sect. 2B-1-MFT, to J. W. Etchison, Casey, $43,744 and $674 respectively; 5 rein.-con. box culverts, Sect. 2B-MFT, to A. Culberson, Pana, $816. Grand total $45,234.

Ill., Virginia—Cass Co., grading 1.8655 mi. Sect. 1A-M.F.T. and 5.9712 mi. 2A-M.F.T. State Aid Route 8, to W. S. Hardwick, Beardstown, $3,472 and $8,172 respectively. Noted June 4.

Indiana—State Hy. Comn., Indianapolis, grading, drainage structures, concrete paving 138,518 sq.yd. Cass Co., to Bontrager Constr. Co., Elkhart, $179,934 est. $233,543—148,436 sq.yd. Putnam Co., to Swords-McDougal-Knapp Co., 114 Fayette St., Peoria, Ill., $277,209 est. $341,517—29,979 sq.yd. Wayne Co., to Hinton & Smalley, Connersville, $40,790 est. $51,563. Grand total $497,933. Noted Apr. 23.

Ind., Brookville—Bd. Comrs. Franklin Co., concrete surfacing John A. Dudley Rd., to A. W. Burns, Brookville, $35,787. Noted May 28.

Ind., Evansville—Vanderburgh Co., asphaltic concrete surfacing 1 mi. West Ohio St. and North West Riverside Dr., also Wedeking Ave., to Reichert Constr. Co., 418 Northwest Riverside Dr., $65,886 and $17,163 respectively est. $66,000 and $17,180 respectively. Noted May 28.

Ind., Evansville—Vanderburgh Co., asphaltic concrete surfacing 0.5 mi. North Willow Rd., to Reichert Constr. Co., Evansville, $25,901. Est. $28,287. Noted May 21.

Ind., Wabash—Wabash Co., concrete surfacing Arnold Shuler Rd., to Kokomo Constr. Co., Kokomo, $21,803 est. $30,150; gravel surfacing Alva Lines Rd., to Sparling Gravel Co., Bluffton Rd., $6,970 est. $15,081.

Ia., Allison — Bd. Comrs. Butler Co., gravel surfacing secondary road system, to Beu & Sons, Sumner, $13,179.

Ia., Boone—Boone Co., gravel surfacing secondary road system, to M. Munson & Sons, Boone, $18,230.

Ia., Cedar Rapids—Linn Co., grading, corrugated culverts on 2.725 mi. Trunk Rd. V, to Foley Constr. Co., Anamosa, $6,997; channel change, corrugated culverts 1.1 mi. local roads, to McGuire Bros., Forrest City, $2,755. Rejected bids June 8 balance road projects. W. H. Behrens, Cedar Rapids, co. aud. Noted June 4.

Ia., Des Moines—Polk Co., grading 10 mi. trunk roads, incl. 76,931 cu.yd. earth excav., 54,936 lb. structural steel, to J. H. Miller, 3900 11th St., Sargent & Roth, Des Moines, S. Jones & Son, Des Moines, and Iowa Bridge Co., 1901 Easton Ave.; resurfacing secondary roads, incl. furnishing, placing 10,475 cu.yd. gravel, to H. C. Young, Prairie City, $6,110.

Ia., Ida Grove—Ida Co., grading, incidental work 8.75 mi. trunk road system, to W. H. Dugan & Sons, Omaha, Neb., $20,574. Noted May 7.

Ia., Marquette—E. M. Donahue, city clk., 10,000 lin.ft. concrete curbing, 18,000 sq.yd. cut-back asphalt paving, to McDougall Constr. Co., 3927 Floyd Ave., Sioux City, $29,000. Noted May 7.

Ia., Newton—Jasper Co., grading secondary road system, to W. F. Dollen, Neola, $4,684—to Mowbray Co., Inc., Waterloo, $6,510—to C. G. Kintz, Colfax, $3,713—to E. McDonald, Albia, $2,471—gravel surfacing, to W. T. Kelley, Des Moines, $23,227. Grand total $40,605. Noted May 21.

Ia., Orange City—Sioux Co., grading, gravel surfacing 26 mi. secondary roads, to C. L. Rutherford, Oskaloosa, $15,641; 19 concrete box culverts, extensions, to C. DeGroot, Maurice, $8,365.

Ia., Pocahontas—Pocahontas Co., gravel surfacing 88,280 cu.yd. secondary roads, to Paul & Donnelly, Ft. Dodge, $30,403.

Kansas—State Hy. Comn., Court House, Russell, grading, culverts, concrete surfacing 3.275 mi. U. S. Hy. 40S, Federal Aid Project 301-A, 20 ft., Russell Co., to Broshnaham Bros., 218 City Bank Bldg., Kansas City, Mo., $80,165.

Ky., Louisville—Jefferson Co., concrete surfacing 6,792 ft. Canal Rd. on United States Government Reservation, at Ohio River Dam 1, 20 ft., to F. G. Breslin Co., 32nd and Market Sts., $26,893.

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Louisiana—State Hy. Comn., Baton Rouge, to R. B. Taylor Co., 1446 Levering St., Louisville, Ky., asphaltic surfacing 17.564 mi. hy. in Avoyalles Parish $80,698—to Royce Kershaw, Inc., Mobile, Ala., 11.95 mi. Washington Parish $112,059 — to Merritt, Chapman & Williams Corp., New Orleans, 15.53 mi. St. Charles and Lafourche Parishes $117,111; 6.25 mi. Lafourche Parish $53,995; 20.25 mi. Jefferson and St. Charles Parishes $162,841—to T. L. Jones & Co., Ruston, 10.522 mi. Catahoula Parish $71,685—to Highway Eng. & Constr. Co., Selbyville, Del., 12.72 mi. Madison Parish $96,483; 21.057 mi. Tensas Parish $169,078—to Fleminken Constr. Co., Shreveport, 14.58 mi. Evangeline Parish $80,698 — to Barber Bros. Constr. Co., Baton Rouge, concrete surfacing 10,757 mi. Allen and Jefferson Davis Parishes $251,260—10.3 mi. Sabine Parish $245,665; 10.9 mi. Vernon Parish $241,047; 9.101 mi. St. Martin Parish $198,839; 8.852 mi. Lafayette and St. Martin Parishes $189,540—to Bishop & Weir, Inc., 6451 East Six-Mile Rd., Detroit, Mich., 8 mi. Tensas Parish $171,171—to R. W. Briggs & Co., New Orleans, 9.691 mi. Rapides Parish $264,193; 7.342 mi. Natchitoches and Rapides Parishes $182,182—to D. Couch Constr. Co., Dothan, Ala., 9.249 mi. Calcasieu and Beauregard Parishes $230,180—to T. S. Clements, Shreveport, 15.7 mi. Bossier Parish $286,228—to S. Monroe & Son, Portsmouth, O., 12.346 mi. Ouachita and Richland Parishes $276,496; 4.922 mi. Calcasieu Parish $129,589—to Mills Engineer Constr. Co., Alexandria, 10.511 mi. Jefferson Davis and Allen Parishes $254,125 — to Sullivan, Long & Hagerty, Bessemer, Ala., 10.606 mi. East Carroll and Madison Parishes $224,371—to Southern Paving Constr. Co., Volunteer Life Insurance Bldg., Chattanooga, Tenn., 6.704 mi. Point Coupee Parish $171,000; 10.98 mi. Vermilion Parish $258,134—to Carey Constr. Co., New Orleans, grading, drainage structures 10.197 mi. Oberville and Ascension Parishes $74,287—to Dixie Development Co., Inc., Alexandria, 4.971 mi. Evangeline, Arcadia and Jefferson Davis Parishes $21,473; 14.551 mi. Allen and Jefferson Davis Parishes $55,242—to Huth Constr. Co., Franklin, 9.675 mi. Tellebonne and Lafourche Parishes $111,430—to Midland Constr. Co., Alexandria, 13.576 mi. Jefferson Davis Parish $71,476—to J. C. Neal, Hermitage, Ark., 13.219 mi. Natchitoches and Red River Parishes $60,332 — to Shruptine Constr. Co., Oakdale, 10.33 mi. Rapides Parish $73,418—to Vollmer & Son, Inc., Blytheville, Ark., 14.424 mi. Point Coupee Parish $77,230 — to H. Pratt Farnsworth, Canal Bank Bldg., New Orleans, bridge in Lafayette Parish $55,225. Grand total $5,119,081. Noted May 14.

La., Bastrop—Moorhouse Parish Police Jury, improving Cain and Wardville Rds., to Alexandria Contg. Co., Alexandria, $8,128 and $2,121 respectively; all gravel contracts, to Clements and & Gravel Co., West Monroe, $16,412. Grand total $26,661.

La., New Orleans — City Council, concrete curbing, concrete and warrenite bitulithic wearing surface paving 7,210 sq.yd., to Craven & Lang, New Orleans Bank Bldg., $33,250.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, concrete paving 2.13 mi. Contr. AA-112-72, Anne Arundel Co., to Aiello Contg. Co., Gough and Dean Sts., Baltimore, $40,348.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, concrete shoulders 7.62 mi. Contr., Wo-101-11, Worcester Co., to Phillips Bros., Salisbury, $23,072. Noted June 11.

Maryland—State Road Dpt., Baltimore, G. C. Uhl, chn., gravel surfacing 2.4 mi. Contr. C-27-82, Culvert Co., to Pembroke & Gasparovic, Park Hall, $16,737. Noted June 4.

Maryland — State Roads Comn., G. C. Uhl, chn., Baltimore, gravel surfacing 1.14 mi. Contr. Sm-85-84, St. Mary's Co., to H. W. Hewitt, Valley Lee, $9,183. Noted May 28.

Md., Baltimore—Concrete paving 20,000 sq.yd. footways listed in Footway Contr. 120, to Guzzo Contg. Co., 1209 North Eden St., $28,491; 10,650 sq.yd. alleys listed in Alley Contr. 144, to Arundel Contg. Co., 910 Trinity St., $16,085.

Massachusetts—Dpt. P. Wks., State House, Boston, A. W. Dean, engr., bituminous macadam paving 1,985 ft. hy. incl. rein.-con. beam bridge over Boston & Maine R.R., Bernardston, and bituminous macadam paving 3,500 ft. hy. South Hadley, to Warner Bros. & Goodwin, Inc., Sunderland, $33,662 and $35,106 respectively— 2,100 ft. hy. Kingston, to Guerini Bros., 22 Regis Rd., Mattapan, $11,553—11,650 ft. Hingham, to B. Weston, Hingham, $49,603—4,474 ft. Foxboro, to Arute Bros., 513 South Main St., New Britain, Conn., $25,366 — grading, drainage structures, bituminous macadam paving 2,950 ft. Westboro, to Carlo Bianchi & Co., Framingham, $25,038—rein.-con. and bituminous macadam paving 42,710 ft. Haverhill, Amesbury and Merrimac, to P. J. Holland, 24 Ames St., Lawrence, $135,049—bitulithic concrete paving 7,135 ft. Harwich, to Lane Constr. Corp., 35 Colony St., Meriden, Conn., $24,206. Grand total $339,583.

Massachusetts—Dpt. P. Wks., State House, Boston, A. W. Dean, engr., bituminous macadam paving 9,020 ft. hy. incl. steel, concrete bridge over Central Vermont R.R., to Lawton Constr. Co., 79 Lenox Ave., Providence, R. I., $193,597. Noted May 21.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt paving Gartland St., to C. Struzziery, 115 Kittredge St., West Roxbury. Est. $25,000.

Mass., Brookline — Town Bd. Selectmen, sheet asphalt and gravel paving Jordan Rd. and Lancaster Terrace, to Edward O'Toole Sand & Gravel Co., Everett St., Norwood. Est. $25,000.

Mass., Brookline—Bd. Selectmen, sheet asphalt paving Cramond Rd. and Lapland St., to C. & R. Constr. Co., 75 Bradeen St., Roslindale. Est. $25,000.

Mass., Lynn—Dpt. P. Wks., 2 in. vulcanized sheet asphalt and warrenite bitulithic paving streets as directed, to John McCourt Co., 910 Huntington Ave., Boston, at $2 per sq.yd. Est. $25,000 or more.

Mass., Marlboro—City, J. F. Granger, engr., City Hall, improving, constructing hys. Day labor. $32,000.

Michigan—A. L. Burridge, div. engr., Cadillac, grading, shaping, drainage structures, one course gravel surfacing 7.276 mi. FO35-18C-1, Iosco Co., to C. A. Tenniswood & Son, Yale, for State Hy. Comn., Lansing, $27,708.

Michigan—A. L. Burridge, div. engr., Cadillac, grading, shaping, drainage structures, concrete surfacing 1.136 mi. FO35—12C-2, Iosco Co., to L. M. Perry, Beaverton, for State Hy. Comn., Lansing, $27,585 incl. cement. Noted June 4.

Michigan—A. L. Burridge, div. engr., Cadillac, grading, shaping, drainage structures, concrete surfacing 6.411 mi. FO4-11C-1, Alpena Co., to Smith Paving Co., 6444 Michigan St., Detroit, and Dearborn, for State Hy. Comn., Lansing, $181,376 incl. cost of cement. Noted May 21.

Michigan—H. W. Hagaman, div. engr., Port Huron, grading drainage structures 12.184 mi. FO44-24C-1, Lapeer Co., to Ianni Constr. Co., 18800 Fitzpatrick St., Detroit, for State Hy. Comn., Lansing, $88,951 incl. cement. Noted June 4.

Michigan—H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, grading, shaping, drainage structures, concrete paving 4.327 mi. FO56-15C-3 and 5.688 mi. FO56-15C-2, Midland Co., to Whitlow & Hobeck, South Haven, for State Hy. Comn., Lansing, $101,398 and $136,242 respectively, both incl. cement. Noted June 4.

Michigan—H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, grading, shaping, drainage structures, concrete paving 3.387 mi. FO25-22C-1, Genessee and Shiawassee Counties, to C. A. Handeyside Co., Detroit, for State Hy. Comn., Lansing, $76,722 incl. cement. Noted June 4.

Michigan — J. T. Sharpensteen, div. engr., Escanaba, grading, drainage structures, 4.915 mi. FO27-25C-1, Gogebic Co., to S. D. Solomon, Lansing, for State Hy. Comn., Lansing, $55,890 incl. cost of cement. Noted May 21.

Mich., Hastings — Barry Co. Road Comn., shaping, grading, drainage structures, guard rail, gravel surfacing 7.5 mi. roads to Brown Bros., Hickory Corners, $27,443. Noted May 26 Daily.

Minn., New Prague — City Clerk, curbing, guttering, concrete paving 15,897 sq.yd., to Booth and Olson, Sioux City, Ia., $36,662; storm sewers, to Jacob Bros., Bird Island, Minn., $3,486. Noted May 28.

Minn., St. Paul—C. A. Carlson, city purch. agt., grading University Ave., to Hanlon & Okes, 1501 Merchants Natl. Bank Bldg., $47,100. Noted May 21.

Missouri — State Hy. Bd., Jefferson City, to Carrollton Constr. Co., Carrollton, grading, concrete paving 3.721 mi. Livingston Co. $29,831; 1.5 mi. Livingston Co. $11,702—to G. W. Condon, 233 Grain Exch. Bldg., Omaha, Neb., 2.011 mi. St. Louis Co. $67,087—3.323 mi. Vernon Co. $60,200; 2.718 mi. Vernon Co. $53,744—to Rouse Constr. Co., Cape Girardeau, 2.248 mi. Daviess Co. $18,103; 2.983 mi. Daviess Co. $35,213; grading 2.854 mi. Daviess Co. $5,074; 3.392 mi. Daviess Co. $7,432—to W. C. Meneely Co., Clayton, grading, concrete paving 0.73 mi. Pike Co. $7,540; 2.075 mi. Pike Co. $21,097; 4.393 mi. Pike Co. $63,572—to C. N. Lund, 815a Chestnut St., St. Louis, 2.779 mi. St. Louis Co. $105,452—to J. Kesl & Sons, Edwardsville, 2.833 mi. Stoddard Co. $54,820; 2.653 mi. Stoddard Co. $32,542—to Harrison Eng. & Constr. Co., 506 Mutual Bldg., Kansas City, 0.240 mi. Callaway Co. $6,489; 3.617 mi. Callaway Co. $42,329; 0.764 mi. Callaway Co. $12,434; 4.994 mi. Callaway Co. $54,020; 3.298 mi. Callaway Co. $42,628; 4.1 mi. Callaway Co. $67,476—to Hoeffken Bros., Belleville, 3.606 mi. Franklin Co. $41,141; 4.537 mi. Franklin Co. $44,824; 4.549 mi. Gasconade Co. $43,089; 4.936 mi. Gasconade Co. $47,451—to M. Wunderlich, 734 Snell Ave., St. Paul, Minn., graveling 2.231 mi. Worth Co. $19,297; 4.545 mi. Lewis Co. $2,797; 4.545 mi. Lewis Co. $2,777; 4.58 mi. Lewis Co. $2,818; 3.217 mi. Montgomery Co. $25,775; 3.298 mi. Montgomery Co. $18,074; 3.999 mi. Dallas Co. $46,632; 4.58 mi. Dallas Co. $19,409; 4.891 mi. Dallas Co. $33,216; 3.481 mi. Marion Co. $2,142; 3.051 mi. Marion Co. $1,902; 4.812 mi. Clark Co. $32,064; 0.139 mi. Clark Co. $509; 4.285 mi. Scotland Co. $42,471; 1.187 mi. Scotland Co. $2,765; 0.711 mi. Scotland Co. $2,014; 4.923 mi. Laclede Co. $31,154; 2.549 mi. Laclede Co. $26,873; 4.628 mi. Laclede Co. $20,552—to Fillin Bros., Marshfield, 3.44 mi. Madison Co. $2,038; 3.44 mi. Madison Co. $1,425—to Chany & Amyx, Branson, 5 mi. Texas Co. $3,833; 1.667 mi. Texas Co. $1,925; 3.672 mi. Texas Co. $2,116; 4.812 mi. Texas Co. $4,140; 3.125 mi. Texas Co. $2,462; 2.99 mi. Wright Co. $9,670; 2.831 mi. Wright Co. $8,168—to A. E. Keith Constr. Co., 614 City

Streets and Roads (Continued)

Bank Bldg., Kansas City, 1.109 mi. Benton Co. $14,396; 3.643 mi. Franklin Co. $23,580—to Lahar Constr. Co., Boonville, 3.56 mi. Pemiscot Co. $13,372—to L. Penzel, Jackson, 1.045 mi. Washington Co. $4,564 — to G. E. Stoner, Charleston, 0.983 mi. Texas Co. $13,104; to Carte-Harlin Constr. Co., West Plains, 3.721 mi. Bollinger Co. $12,526; 3.284 mi. Bollinger Co. $17,134; 3.171 mi. St. Francois Co. $17,287; 1.934 mi. Madison Co. $8,347; grading 4.988 mi. Madison Co. $5,952—to Spangler Constr. Co., Kansas City, 3.772 mi. Lafayette Co. $26,463—to Campbell, Davis & Schultze, Troy, 2.829 mi. Madison Co. $11,841—to Samples & Elsea, Kirksville, shale surfacing 3.027 mi. Boone Co. $15,081; 2.841 mi. Boone Co. $11,511 —to Jewett & Hardy, Shelbina, chats surfacing 3.295 mi. Daviess Co. $13,594—to Pittsburgh-Des Moines Steel Co., Tuttel and Southwest 10th Sts., Des Moines, Ia., crushed stone surfacing 4.462 mi. Randolph Co. $36,738; 4.629 mi. Randolph Co. $38,507—to Rouse Constr. Co., Cape Girardeau, concrete paving 2.854 mi. Daviess Co. $31,143; 3.392 mi. Daviess Co. $36,293—to Armstrong Paving Co., 606 Crocker Bldg., Des Moines, Ia., bituminous retreading 4.089 mi. Lawrence Co. $23,480; 3.441 mi. Lawrence Co. $19,356; 3.046 mi. Lawrence Co. $18,009—to B. F. Brooks Constr. Co., Love Field, Dallas, Tex., grading 4.209 mi. Chariton Co. $20,669; 4.238 mi. Chariton Co. $21,463. Grand total $1,780,818. Rejected bids graveling 1.799 mi. New Madrid Co. Noted May 21.

Nebraska—State Hy. Dpt., Lincoln, paving 9.5 mi. Federal Aid Project 105-C, Cozad-Gothenburg Rd., 20 ft., Dawson Co. and grading, oiled sand surfacing 6.9 mi. Federal Aid Project 80-E, Mullen Hecla Rd., 24 ft., Hooker Co., to Roberts Constr. Co., 404-5 1st Natl Bldg., Lincoln, $194,306 and $55,085 respectively—paving 5.8 mi. Federal Aid Project 68-B, McCook-Culbertson Rd., and 3.8 mi. Federal Aid Project, 46, Indianola-McCook Rd., Red Willow Co., to National Constr. Co., 305 Arthur Bldg., Omaha, $152,846 and $113,632 respectively, both 20 ft. wide. Grand total $515,869.

Nevada—State Hy. Comn., Carson City, oil processing roadbed 10.18 mi. hy. in Clark Co. and grading, draining 1.11 mi. hy. Lyon Co., to Nevada Rock & Sand Co., Inc., Reno, $17,915 and $34,040 respectively est. $27,092 and $39,826 respectively—grading, surfacing roadbed 1.32 mi. Clark Co., to General Constr. Co., Las Vegas, $21,131 est. $26,168—17.5 mi. White and Pine Counties, to Wheelwright Constr. Co., Ogden, Utah, $93,140 est. $123,663. Grand total $166,226.

New Hampshire—State Hy. Dpt., Concord, 6 in. one course rein.-con. on 8 in. gravel base course surfacing 31,278 sq.yd. South Side Rd., Peterboro, to Arborio Road Constr. Co., Inc., 525 Main St., Hartford, Conn., $93,026 est. $110,000; 33,521 sq.yd. Daniel Webster Rd., Franklin, to Carlo Bianchi & Co., Framingham, $76,278 est. $120,000. Noted June 4.

N. J., Little Falls—Twp. Comn., Municipal Bldg., bituminous macadam paving Lower Notch Rd., to Francisco Bros. Co., Bridge Rd. Est. $25,000. Noted June 5.

N. J., Rutherford—Bd. Freeholders Bergen Co., Court House, Hackensack, grading, sheet asphalt on concrete repaving Erie Ave., to G. M. Brewster, 253 West Fort Lee Rd., Bogota, $44,759.

New York—A. W. Brandt, comrs. Hys., Albany, bituminous macadam paving 6.66 mi. Suffolk Co., to Johnson, Drake & Piper, Inc., 1st Natl. Bank Bldg., Freeport, $271,371 est. $366,599—1.91 mi. Essex Co., to C. D. Perry, Albany, $111,345 est. $151,733—0.46 mi. Schuyler Co., to F. F. Cass, Inc., 120 Congress Ave., Rochester, $17,330 est. $22,836—5.59 mi. Cattaraugus Co. to P. J. Knickenberg, Buffalo, $242,312 est. $321,920—concrete paving 7.66 mi. Franklin Co., to Lane Constr. Co., 37 Colony St., Meriden, Conn., $313,781 est. $406,171—12.07 mi. Herkimer Co., to McHugh Bros., Springfield, O., $459,175 est. $604,458—5.1 mi. Herkimer Co., to Warren Bros. Co., Cambridge, Mass., $300,232 est. $430,245—1.26 mi. Warren Co., to J. P. Dugan & Co., Amsterdam, $71,848 est. $109,150—3.76 mi. Monroe Co., to Rochester Vulcanite Paving Co., Exchange Bldg., Rochester, $299,197 est. $416,490—1.86 Nassau Co., to Westchester Constr. Co., New Hy., Farmingdale, $148,503 est. $194,823—2.59 mi. Wayne Co., and 2.96 mi. Franklin Co., to Sola Constr. Co., New York, $93,076 and $107,118 respectively est. $126,081 adn $148,398 respectively. Grand total $2,435,288. Noted May 21.

N. Y., Brooklyn—July 1, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, granite block on concrete repaving Mill St. and Flushing Ave. — grading, curbing, flagging East 51st St., Avenue U and DeWitt Ave.; asphalt on concrete paving Lamont, Court, Beverly, Dahill and Lenox Rds., Ashland Pl., Ditmas, Driggs, Johnson, and 6th Aves.; Carroll, East 4th, East 28th, East 35th, East 46th, East 49th, East 15th, East 52nd, Pine Sts.—grading Warwick St.

N. Y., Irondequoit—Curbing, paving St. Paul Blvd., to Syracuse Asphalt Paving & Contg. Co., Union Bldg., Syracuse, $48,202 and $65,602 respectively.

N. Y., Rochester—Widening, asphalt paving Lake Avenue Blvd., to J. Petrossi, 68 Main St., $166,510.

N. Y., Syracuse—Bd. Contr. & Supply, repaving South State St., to Onondaga Constr. Co., 831 Lancaster Ave., $48,373.

O., Cincinnati—C. A. Dykstra, city mgr., City Hall, concrete curbing, guttering, cement sidewalks, grading, concrete paving 6,200 sq.yd. Oakwood Ave. from North Bend Rd. to Belmont Ave., to C. I. Baldwin, Fountain Sq. Bldg., $20,572 est. $26,240; concrete curbing, guttering, cement sidewalks, grading, sheet asphalt paving 3,000 ft. Delta Ave. from Erie Ave. to Linwood Ave., to Hannon-Hughes Constr. Co., Atlas Bldg., $62,468 est. $80,116. Noted May 4.

Oklahoma—State Hy. Dpt., Oklahoma City, grading, drainage structures 10.07 mi. Greer Co., 32 ft., to Dan Sweeney, 614 West 11th St., Oklahoma City, $47,389 est. $60,000—12.03 mi. Marshall Co., 30 and 32 ft., to Blackburn Constr. Co., Healdton, $64,245 est. $75,000—8.51 mi. Wagoner Co., to J. J. Harrison, Holdenville, $47,897 est $55,000. Grand total $159,531.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, drainage structures, waterbound macadam surfacing 29,122 sq.yd. Wayne Twp., Schuylkill Co., to Diehl, Henneberger & Wishard, Greencastle, $124,805—72,452 sq.yd. Conoy and East Donegal Twps., Lancaster Co., to Union Paving Co., Broad and Stiles Sts., Phila., $116,260 — 29,762 sq.yd. Farmington Twp., Clarion Co., to Seaborn & Walter, Route 3, Hubbard, O., $58,600—54,745 sq.yd. Jefferson, Indiana and Clearfield Counties, to D. Baily, Morrisdale, $132,149—waterbound macadam surfacing 33,630 sq.yd. Lackawaxen Twp., Pike Co., to Lane Constr. oCrp., 37 Colony St., Meriden, Conn., $33,602—concrete surfacing 13,060 sq.yd. College and Benner Twps., Center Co., to Corrado & Galiardi Constr. Co., Connellsville, $29,171. Grand total $494,590. Noted May 28.

Pa., Phila.—Bureau Hys., Dpt. P. Wks., City Hall Annex, A. Murdock, dir., to Barber Asphalt Co., E St. and Hunting Park, asphalt paving (assessment work) Walnut St. from Limekiln to Woolston Sts. $5,161—to Union Paving Co., Broad and Stiles Sts., asphalt repaving Media St. from 52nd to 56th Sts. $22,155; 4th St. from Thomas to Girard Sts. $4,570; redressed granite block repaving 18th St. (track area) from Wharton to Reed Sts. and from Ritner to Shunk Sts. $8,682—to Eastern Asphalt Co., Pennsylvania Bldg., asphalt repaving Westmoreland St. from Broad to 17th Sts. $12,182. Grand total $52,750. Noted June 4.

Pa., Phila.—Bureau Hys., Dpt. P. Wks., City Hall Annex, A. Murdock, dir., smooth dressed granite block repaving Race and Vine Sts. from 6th to Franklin Sts., to Eastern Asphalt Co., Pennsylvania Bldg., asphalt repaving Westmoreland St. from Broad to 17th Sts. $12,182. Grand total $52,750. Noted June 4.

South Dakota—State Hy. Comn., Pierre, graveling 13.749 mi. Kingsbury and Brookings Counties, to T. J. Tobin Constr. Co., Sioux Falls, $25,657—grading 18.094 mi. Meade Co., to Verne Russell, Watertown, $42,067—oil treating 14.559 mi. Bon Homme Co., to Summit Constr. Co., Summit, $30,916, all 20 ft. wide. Grand total $98,640.

Tenn., Chattanooga — Bd. Comrs. Hamilton Co., widening, improving Crest Rd. on Missionary Ridge, to J. J. Higginson, Macon, Ga., $150,185.

Tex., Corsicana—Navarro Co., c/o J. M. Tullos, aud., grading, drainage structures 7.5 mi. road, 20 ft., to Tickesson & Shilling, Waco, $18,291. Est. $30,000. Noted June 4.

Tex., Waco—McLennan Co., rein.-con. paving 3 mi. roads, to Dallas Transportation Co., 817 Bourbon St., Dallas, $54,407.

Virginia—State Hy. Dpt., Richmond, concrete surfacing 7.6 mi. roadway in Nansemond Co., to R. G. Lassiter & Co., Raleigh Bank & Trust Bldg., Raleigh, N. C., $141,527—1.3 mi. Accomac Co., to Spottsylvania Constr. Co., Highland Springs, $32,449—one course macadam surfacing 4.4 mi. Tazewell Co., to Tazewell Constr. Co., Richlands, $35,393—2.4 mi. Alleghany Co., to Pocahontas Constr. Co., Cass, W. Va., $52,676—top-soiling 4.6 mi. Franklin Co., to C. A. Ragland, Louisburg, N. C., $35,821. Grand total $297,866. Noted May 28.

Washington—S. J. Humes, dir. Hys., Olympia, grading, concrete paving 93,369 sq.yd. Yakima Co., to Erickson Paving Co., Inc., 1550 North 34th St., Seattle, $202,337—crushed stone surfacing 5,140 cu.yd. Jefferson and Clallam Counties, to Port Townsend Sand & Gravel Co., 640 Adams St., Port Townsend, $8,559—21,000 cu.yd. Yakima and Kittitas Counties, to C. J. Erickson, 1424 Vance Bldg., Seattle, $99,991—22,300 cu.yd. Clark and Skamania Counties, to Milne & Dussault, 1853 East Bway., Portland Ore., $83,620; rolling bituminous material 27 mi. same road, to Kern & Kibbe, 290 East Salmon St., Portland, Ore., $51,215—crushed stone surfacing 84 mi. Stevens and Ferry Counties, to M. E. Nelson Constr. Co., Tonasket, $26,894. Grand total $472,616. Noted May 28.

Wash., Bellingham — Whatcom Co., paving Guide Meridian Rd., to G. D. Nolty, Bellingham, $39,713. Est. $40,000. Noted May 7.

Wash., Seattle—Bd. P. Wks., City Hall, concrete paving 15,360 sq.yd. Nickerson St., to J. Paduano & Co., 7301 Dibble Ave. N. W., $47,142.

Wash., Walla Walla — Repairing, replacing non-skid asphalt paving, to Standard Asphalt Paving Co., Chronicle Bldg., Spokane, $28,708.

West Virginia—State Hy. Comn., Charleston, concrete surfacing 0.78 mi. Braxton Co., to P. S. Horner Co., Clarksburg, $36,119—9.71 mi. Grant and Harvey Counties and tar surfacing 13.09 mi. Hampshire and Mineral Counties, to Keely Constr. Co., Clarksburg, $40,489 and $52,450 respectively—Project 2201 and Route 18, Wayne Co., to Billups & Wellman, Huntington, $14,426 and $40,134 respectively—gravel surfacing 12.4 mi. Ritchie and Tyler Counties, to Bonner & Bonner, Cameron, $61,969—grading, drainage structures Project 3501 Mason Co. and Project 3485 Wyoming Co., to Pinnell & Pfost, Ripley, $100,983 and $186,575 respectively — grading, drainage structures Project 3484, Mercer Co., to Dikas Bros., Waynesville, N. C., $195,538—Project 3483, Kanawha Co., to Board & Board, Charleson, $94,812—grading, drainage structures, shale surfacing 7.91 mi. Mineral Co., to J. D. Solazo, Pittsburgh, Pa., $177,928. Grand total $1,001,423. Surface treating 21.8 mi. Randolph Co., to Bartlett Constr. Co., Clarksburg.

Wisconsin—Dane Co. Hy. Comn., Madison, to J. B. Schoephoerster, Prairie Du Sac, grading 4 mi. Co. Project 648-18, Medina, $2,876; 1.5 mi. Co. Project 649-18, Medina, $994—to A. W. Gallagher & Son, Madison, 3.2 mi. road in Medina and Deerfield, $1,712; graveling road in Sun Prairie, $1,313; 0.5 mi. Waubesa Beach Rd., $1,200—to Endres Bros., Cross Plains, 1.9 mi. in Springfield, $1,879—to T. Ayen, Mount Horeb, roads in Vermont $4,215 — to P. Fredrickson, Blue Mounds, 4.6 mi. Vermont $3,708—to I. Napstad, Madison, 1.5 mi. in York, $1,529—to G. Kivlin, 6060 West Olin Ave., Madison, graveling 2.5 mi. County Trunk P $472; 1.9 mi. Springfield $1,361—to T. Lingard, Riley, 1 mi. Trunk K, Berry $756; 1 mi. Berry $1,050—to A. Ehle Co., Stoughton, 2.5 mi. County Trunk N, Sun Prairie, $900—to W. McWain, Galesville, 0.35 mi. Albion, $1,276 —to Rein & Dahl, Stoughton, 1 mi. in Berry $840—to G. Hughes, Arena, 3.25 mi. Roxbury, $2,503—to A. G. Bolland, Mount Horeb, Field Bridge, Springdale, $1,967. Grand total $30,551.

Wisconsin—Comrs. Iowa Co., J. E. Wedlake, comr., Dodgeville, to C. L. Wonn, Dodgeville, crushed stone surfacing County Trunk Hys. U and S, $11,856; 4,550 cu.yd. Highland and Eden Town Rds., $4,823; 8,500 cu.yd. County Trunk Hys. K and H and Brighton Rds., $9,265 —to Cedarburg Constr. Co., Cedarburg, mine tailing surfacing County Trunk Hys. G and E, Mifflin Rds. $3,488—to W. R. DuBois, Baraboo, Clyde-Richardson Rd., $500—to Deppe Lumber & Produce Co., Baraboo, 3,000 cu.yd. John Shea Rd. $840—to J. T. Trucking Co., 2450 North 7th Lane, Milwaukee, 7,600 cu.yd. County Trunk Hys. A, E and G and Lannigers Corners Rd., $2,142; on Dodgeville-Union Rd., Eden Mount Hope Rd. and County Trunk G and Governor Dodge Rd., $8,835. Grand total $41,749.

Wisconsin—State Hy. Comn. and Hy. Comrs., Columbia, Grant, Shawano and Sauk Counties, Madison, grading, graveling 1.205 mi. Portage-Baraboo Rd., S. T. H. 33, F. A. P. 177, to F. Mashuda, Milwaukee, $22,040—concrete paving 0.389 mi. Wittenburg-Overhead Approaches, to H. J. Kahler, Washburn, $49,599; crushed stone surfacing Rockville-Dickerville Rd., to Watson-Jenkins Constr. Co., Rewey, $5,412. Grand total $75,051. Noted June 4.

Ont., Alvinston—Lambton Co. Council, concrete paving Main St., to Sweet & Dewar, 171 Brock St. S., Sarnia. Est. $40,000.

Ont., Bridgeburg—Bertie Twp. Council, asphalt paving 1 mi. Point Abino and Crescent Rds., to Law Constr. Co., 225 Sterling Rd., Toronto.

Ont., Brockville—Concrete paving Water and Part Sts., day labor, $36,700. G. K. Dewey, City Hall, engr.

Ont., Fort William—Council, concrete curbing $12,408, concrete sidewalks, $18,134, sub base City Rd. $16,000, concrete boulevards, $3,397, separate contracts, under supervision A. McNaughton, city engr. Grand total $49,939.

Ont., New Liskeard—W. P. Ackroyd, town clk., concrete paving Armstrong and Whitewood Sts., to McNamara Constr. Co., 53 Yonge St., Toronto, $71,900. Noted June 4.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ark., England—Bd. Comrs. Plum Bayou Levee Dist., N. B. Beakley, pres., soon takes bids repairing, raising 40 mi. levee along Arkansas River. $80,000. Dickinson & White, Rector Bldg., Little Rock, engrs.

La., Cameron—Bd. Comrs. Cameron Co. new gravity drainage system. $25,000.

Wis., Milwaukee—Harbor Comn. car ferry slips, buildings, bulkheads, improving grounds and railroad facilities on Jones Island. $1,500,000. C. U. Smith, Milwaukee, ch. engr.

BIDS ASKED

La., St. Joseph—July 6, by Bd. State Engineers, 207 New Orleans Court Bldg., improving 14,000 ft. Lake St. Peter Drainage Diversion, incl. 275,000 cu.yd. excav., in 5th Louisiana Levee Dist., Tensas Parish. D. C. Daniels, secy.

Pa., Johnstown—July 6, at office W. C. Wehn, secy. School Bd., Central High School Bldg., rein.-con. retaining wall with guard rail 500 ft. long, along river channel at Central High School with possible extension to 620 ft. length, also excavating river channel to established grades, removing surplus material not needed for backfill. Gray & Claflin, engrs.

Tex., Port Isabel — San Benito-Port Island Navigation Dist., c/o E. Downs, San Benito, taking bids docks, wharves, warehouse facilities, $150,000. W. E. Brown, Port Isabel and San Benito, dist. engr. Noted June 11.

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Excavation, Drainage, Irrigation, Levees, River and Harbor (Continued)

Ont., Port Colborne—July 7, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, repairing West Breakwater. $40,000.

CONTRACTS AWARDED

Calif., Long Beach—Bd. Comrs. Los Angeles Co., dredging, filling outer harbor, to San Francisco Bridge Co., 14 Montgomery St., San Francisco, $124,609. Noted Apr. 30.

Calif., Richmond—Dredging Ford Channel in Richmond Harbor, to Franks Contg. Co., 260 California St., San Francisco, $32,615.

Ga., Augusta—Augusta Levee Comn., T. S. Gray, chn., 240,000 cu.yd. earth excav., widening, raising levee, Proposal 1, 13,000 cu.yd. excav., and Proposal 2, 4,000 cu.yd. excav., to Claussen-Lawrence Constr. Co., 1394 Gwinnett St., $2,750 and $2,320 respectively; Proposal 3, 33,000 cu.yd. excav., and Proposal 4, 190,000 cu.yd. excav., to Hooper Constr. Co., Bunnell, $9,900 and $47,500 respectively. Grand total $63,470. Est. $80,000. Noted Mar. 12.

Mass., Barnstable—Hyannisport Civic Assn., R. S. Richards, pres., c/o G. F. Clements, engr., 239 Main St., Hyannis, dredging Hyannisport, to W. E. Burke, 20 Enfield St., Winthrop. Noted June 18.

Ont., Collingwood—N. Desjardins, secy. Dpt. P. Wks., Ottawa, dredging, to Canadian Dredging Co. Ltd., Midland, $131,540. Noted Apr. 30.

Bond Elections

Coming Bond Elections

Memorial Building and Court House — Devils Lake, Ramsay County, N. D., June 30, $350,000.

Schools — Jackson Parish, La., June 30, $150,000.

Junior High School—Longview, Tex., June 30, $175,000.

Bonds Voted

Toll Bridge — Douglas Co., Neb., $2,000,000. Ash, Howard, Needles & Tammen, Kansas City, Mo., engrs.

Irrigation System—San Benito, Tex., Cameron County Irrigation Dist. 15, $210,000.

High and Grade School — Glenshaw, Shaler Twp., Pa., $250,000.

Bonds Defeated

Sewage Disposal — Kalispell, Mont., $100,000. F. R. Scott, city engr.

Park Improvements—Torrance, Calif., $150,000. A. H. Bartlett, city clk.

FEDERAL GOVERNMENT

PROPOSED WORK

Idaho, Weiser—POST OFFICE—Treas. Dpt. at office Sup. Archt., sketches U. S. Post Office, $110,000. J. A. Wetmore, acting superv. archt. Noted Feb. 19.

Mass., Middleboro—POST OFFICE—Treas. Dpt. at office Sup. Archt., 1 story, basement, brick, stone, Union and Center Sts. $105,000.

New Jersey and Pennsylvania—DREDGING—U. S. Eng., Phila., Pa., in Delaware River between Trenton, N. J., and Phila., Pa. $300,000.

Pa., Erie—POST OFFICE—Treas. Dpt. at office Sup. Archt., returned unopened all bids to have been opened June 17, for U. S. Post Office. Will readvertise. Noted May 28.

Ont., Ottawa—OFFICE—State Dpt., Wash., D. C., soon takes bids office building, $300,000. Cass Gilbert, 244 Madison Ave., New York, archts.

BIDS ASKED

Ala., Montgomery—TANK—July 17, by Con. Q.M., Maxwell Field, 300,000 gal. steel tank on 100 ft. trestle at Maxwell Field; adv. E.N.-R. June 25.

Ga., Augusta—QUARTERS—July 14, by Vet. Bu., Arlington Bldg., Officers Duplex Quarters 32 and 33, incl. walks, grading, drainage, at U. S. Veterans' Hospital.

Ga., Madison—POST OFFICE—July 2, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

Ga., Monroe—POST OFFICE—July 7, by Treas. Dpt. at office Sup. Archt., U. S. Post Office. $60,000.

Ga., Sandersville—POST OFFICE—July 7, by Treas. Dpt., at office Sup. Archt., U. S. Post Office.

Ga., Toccoa — POST OFFICE — July 6, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

Ga., Waynesboro—POST OFFICE—July 7, by Treas. Dpt. at office Sup. Archt., U. S. Post Office. Noted Dec. 25.

Illinois—LEVEE—July 8, by U. S. Eng., 428 Custom House, St. Louis, Mo., 157,000 cu.yd. earthwork in reconstructing, enlarging levee in Crane Creek Drainage & Levee Dist., Schuyler Co.; adv. E.N.-R. June 25.

Ia., Atlantic—REMODELING, etc.—July 13, by Treas. Dpt. at office Sup. Archt., remodeling, enlarging U. S. Post Office; adv. E.N.-R. June 25.

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Kan., Wolcott—DIKES—June 29, by U. S. Eng., 707 Postal Telegraph Bldg., Kansas City, Mo., 14,800 lin.ft. standard pile clump dikes and 6,000 lin.ft. standard revetment in Missouri River at Weavers and Pomeroy Bends, 2 mi. down stream from here.

Ky., Falmouth—POST OFFICE—July 9, by Treas. Dpt. constructing U. S. Post Office.

Ky., Murray—POST OFFICE—July 20, by Treas. Dpt. at office Sup. Archt., constructing U. S. Post Office; adv. E.N.-R. June 25.

Ky., Prestonsburg—POST OFFICE—July 10, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E.N.-R. June 25.

Louisiana—EARTHWORK—July 10, by U. S. Eng., foot Prytania St., New Orleans, 1,000,000 cu.yd. earthwork in Australia Point Levee; 550,000 cu.yd. in South Bank Red River Levees, 2nd New Orleans Levee Dist.

Massachusetts — DREDGING — June 30, by U. S. Eng., Customhouse, Boston, riprapping banks of Cape Cod Canal.; adv. E. N.-R. June 25. Noted Jan. 15.

Mass., Springfield—STEEL—June 30, by Commanding Officer, 5,000 lb. carbon steel for Springfield Armory.

Mich., Selfridge Field—SHOP, WAREHOUSE, etc.—July 7, at office Con. Q.M., 1 air corps, assembly shop, 1 air corps warehouse and 4 aircraft hangars; adv. E. N.-R. June 25. Noted June 18.

Mo., Bonnot's Mill—DIKES—June 27, by U. S. Eng., 707 Postal Telegraph Bldg., Kansas City, 5,180 lin.ft. standard pile clump dikes in Missouri River at Isbell Reach, 4.9 mi. downstream from here.

N. H., Claremont—POST OFFICE—July 13, at office Sup. Archt., U. S. Post Office; adv. E. N.-R. June 25. Noted May 7.

N. J., Fort Monmouth—ROADS, etc.—July 20, by Con. Q.M., roads, walks, drains, gas and water lines, sewers; adv. E.N.-R. July 25.

Nev., Las Vegas—POST OFFICE—July 22, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

N. M., Santa Fe—REMODELING—July 15, by Treas. Dpt. at office Sup. Archt., remodeling mechanical equipment, etc., at U. S. Court House.

Tenn., Huntington—POST OFFICE—July 9, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

Tenn., Memphis—EARTHWORK—July 7, by U. S. Eng. Office, Memphis, 1,498,000 cu.yd. earthwork in Lower St. Francis Levee Dist.

Tex., Houston — DREDGING — July 17, by U. S. Eng., Galveston, 4,740,300 cu.yd. in Houston Ship Channel; adv. E. N.-R. June 25. Noted Apr. 2.

Tex., Longview—REMODELING, etc.—July 14, by Treas. Dpt. at office Sup. Archt., remodeling, enlarging U. S. Post Office; adv. E.N.-R. June 25.

Tex., Paris—ELEVATOR—July 8, by Treas. Dpt. at office Sup. Archt., elevator, at U. S. Veterans' Hospital.

Virginia—ROAD—June 26, by Pub. Rds., Willard Bldg., Wash., D. C., grading 22.07 mi. road in Shenandoah Natl. Park area.

Va., Fort Monroe—SIDEWALKS—July 21, at office Con. Q.M., sidewalks, roads, curbs, N.C.O. area, Longley Field; adv. E.N.-R. June 25.

Va., Langley Field—CLUB—July 15, at office Co. Q. M., Fort Monroe, service club for noncommissioned officers; adv. E. N.-R. June 25.

Va., Langley Field—HEATING PLANT—July 14, by Con. Q. M., Fort Monroe, heating plant for barracks buildings. $100,000.

Va., Langley Field—LABORATORY—July 16, by U. S. Eng., Fort Monroe, photographic laboratory. $41,000; adv. E. N.-R. June 25.

Va., Norfolk—DREDGING—July 21, by U. S. Eng., 128,151 cu.yd. Scotts Creek, Norfolk Harbor; adv. E.N.-R. June 25.

Va., Manassas—POST OFFICE—July 8, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E.N.-R. June 25.

Va., West Point—POST OFFICE—July 8, by Treas. Dpt. at office Sup. Archt., U. S. Post Office. $65,000.

Wash., Seattle — DREDGING — June 30, by U. S. Eng., Burke Bldg., dredging 1.5 mi. Duwamish Waterway. $190,000. Noted June 18.

Wash., Seattle — FEDERAL — July 21, by Treas. Dpt. at office Sup. Archt., constructing Federal Office Building. $2,375,000. Noted Nov. 20.

Canal Zone—DAM—Sept. 1, by H. Burgess, gov., Panama Canal, Munitions Bldg., Wash., D. C., constructing Madden Dam, power plant and appurtenant works, for Madden Dam Project, near Alhajuela, on upper Chagres River. Noted Mar. 12.

CONTRACTS AWARDED

Arizona—ROADS—C. D. Sweetser, dist. engr. Pub. Rds., Ellis Bldg., Phoenix, grading 16.32 mi. Petrified Forest Natl. Monument Hy. 1, to Everly & Allison, Albuquerque, N. M., $95,602; 0.276 mi. same road, to W. E. Callahan, Kirby Bldg., Dallas, Tex., $136,183. Noted May 28.

Colorado—ROAD—Pub. Rds., Denver, grading, draining 2.063 mi. Six Mile Creek Natl. Forest Rd., Pike Natl. Forest, Jefferson Co., to Hamilton & Gleason Co., Tram Bldg., Denver, $55,674. Noted May 26.

D. C., Wash.—WAREHOUSE, etc.—Con. Q.M., Army Medical Center, warehouse, laundry, bakery at Walter Reed Hospital, to H. R. Blagg Co., 1229 East 3rd St., Dayton, O., $174,445. Noted Apr. 30.

Ga., Savannah—POST OFFICE—Treas. Dpt. at office Sup. Archt., remodeling, enlarging U. S. Post Office, to J. M. Geary Co., Asheville, N. C. $12,300. Noted May 21.

Idaho—ROAD—Dpt. Agriculture, Pub. Rds., Ogden, Utah, grading, surfacing 17.427 mi. Yellowstone Natl. Park Hy., Targee Natl. Forest, Fremont Co., to O. Nelson, Logan, Utah, $137,054. Est. $137,829. Noted May 26.

Ind., Indianapolis — NURSES' HOME — Vet. Bu., Arlington Bldg., nurses' quarters storehouse, to Ralph Sollitt & Sons Constr. Co., South Bend, $99,924. Noted May 21.

Ia., Knoxville—QUARTERS—Vet. Bu., Arlington Bldg., officers duplex quarters, to Morley Constr. Co., 1643 Belleville Ave., Kansas City, $135,900. Noted Apr. 16.

La., Shreveport — PAINT, OIL and DOPE HOUSE, etc.—Con. Q. M., Barksdale Field, general contract paint, oil, and dope house, photographic laboratory, radio and parachute buildings, post exchange and utilities building, to K. C. Wilson, Shreveport, $97,840. Noted May 7.

Me., Portland—COURT HOUSE—Treas. Dpt. at office Sup. Archt., remodeling and constructing court house extension, to National Constr. Co., Tower Bldg., Wash., D. C., $343,000. Noted May 21.

Mass., Westfield — POST OFFICE — Treas. Dpt. at office Sup. Archt., remodeling, extending U. S. Post Office, to Nelson Constr. Co., Springfield, $21,469. Noted May 14.

N. Y., Buffalo—BULKHEAD—Superintendent Lighthouses, concrete pile bulkhead and dredging at lighthouse, to Foundation Waterproofing Co., 53 West Jackson Blvd., Chicago, Ill., $29,980. Noted Apr. 30.

N. C., Fort Bragg—HOSPITAL—Con. Q.M., hospital, to W. P. Rose Co., Goldsboro, $256,650. Noted May 14.

R. I., Newport — FERRY RACK — Yards & Docks, Navy Dpt., repairing ferry rack at Naval Torpedo Station, to Booth & Chase Co., Inc., Fall River, Mass., $5,190.

S. C., Rock Hill—ELEVATOR—Treas. Dpt. at office Sup. Archt., passenger elevator at U. S. Post Office to Otis Elevator Co., 810 18th St., Wash., D. C., $10,664. Noted May 28.

Tenn., Memphis—PILE DIKE—U. S. Eng., Memphis, 1,400 lin.ft. permeable pile dike in Mississippi River, below Island 35 on Arkansas side, to Patton-Tully Transportation Co., Memphis, $44,790.

Texas—BEACON STATIONS—W. E. Erwin, chn. Div. Supplies, Dpt. Commerce, 7 beacon stations on El Paso, Tex.-Phoenix, Ariz., airway, to Airports Eng. & Constr. Co., Love Field, Dallas, $48,558. Noted Apr. 23.

Utah, Salt Lake City—EXTENDING, etc.—Treas. Dpt. at office Sup. Archt., extending, remodeling U. S. Post Office, to Orndorff Constr. Co., 437 South Hill St., Los Angeles, Calif., $815,000; elevator, to Otis Elevator Co., 50 Exchange Pl., $44,705. Noted May 7.

Va., Quantico—PUMP HOUSE, etc.—Yards & Docks, Navy Dpt., concrete, brick pump house, tanks, at Marine Barracks, to J. F. Fitzgerald Constr. Co., 39 Chauncy St., Boston, Mass., $8,803. Noted May 28.

Wash., Seattle—ELEVATOR PLANT—Treas. Dpt. at office Sup. Archt., elevator plant at U. S. Marine Hospital, to Otis Elevator Co., 2200 4th St., $61,127.

Wyoming—ROAD—Pub. Rds., Denver, Colo., grading, surfacing 8.574 mi. Hoback Canyon Natl. Forest, Teton Natl. Park, Teton Co., to Campbell Building Co., Newhouse Bldg., Salt Lake City, Utah, $61,968. Noted May 21.

T. H., Pearl Harbor — CONCRETE MIXING PLANT—Yards & Docks, Navy Dpt., concrete mixing plant, at Navy Yard, to Von Hamm Young Co. Ltd., Honolulu, $14,098.

RAILWAYS

PROPOSED WORK

Texas—Fort Worth & Denver Northern R.R., subsidiary Fort Worth & Denver City Ry., subsidiary Colorado & Southern Ry., R. G. Gowdy, ch. engr., Denver, Colo., 114 mi. line between Shamrock and Wellington. $4,000,000.

SUBWAYS AND TUNNELS

BIDS ASKED

Mass., Boston—July 15, by Transit Dpt., constructing Sect. B traffic tunnel; adv. E.N.-R. June 25.

CONTRACTS AWARDED

N. Y., Brooklyn—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, installing tracks and contact rail, Contr. T-60, to McElroy & Kerwin, Inc., 370 Lexington Ave., New York, $350,696. Noted June 4.

GRADE CROSSINGS

PROPOSED WORK

Ark., Forrest City—Chicago, Rock Island & Pacific R.R. Co., La Salle St. Sta., Chicago, Ill., W. H. Peterson, ch. engr., preliminary plans rein.-con. underpass on State Hy. 70 west of city limits. $25,000.

N. J., Clifton—Bd. City Council, City Hall, vehicular underpass East 9th St. or pedestrian underpass at East 5th St., under Erie R.R. $25,000 or more. Project in abeyance. J. L. Fitzgerald, city engr. Noted May 28.

Tex., Fort Worth—City rein.-con., steel underpass, East 9th St. D. L. Lewis, Fort Worth, engr.

Grade Crossings (Continued)

BIDS ASKED

Calif., Burbank—July 6, by Bd. Supervs. Los Angeles Co. (Los Angeles), grade separation on Southern Pacific R.R. Coast Line at Victory Pl., incl. 182 cu.yd. A, 989 cu.yd. D and 36 cu.yd. F concrete, 19,495 cu.yd. excav., 29,971 lb. reinforcing steel, 634 lin.ft. concrete pipe. To exceed $30,000. Southern Pacific R.R. Co., 65 Market St., San Francisco, G. W. Boschke, ch. engr., to furnish superstructure.

New York—See "Streets and Roads."

CONTRACTS AWARDED

Mich., Detroit — Wayne Co. Road Comn., rein.-con., steel grade separation structure to carry railroad tracks over hys. Allen Rd. and Outer Dr. and Wabash R.R., to Bryant & Detwiler Co., 2806 Union Guaranty Bldg. Est. $100,000. Noted June 19, 1930.

Mo., St. Louis — Bd. P. Serv., City Hall, rein.-con., tile lined pedestrian underpass on south side Market St., to Woermann Constr. Co., 3800 West Pine Blvd., $15,777. Est. $20,000. Noted May 21.

N. Y., Port Jervis—Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, reconstructing hy. bridge carrying West Main St. over tracks, to Ferguson & Edmondson, Keystone Bldg., Pittsburgh, Pa. $57,409. Est. $97,884.

Okla., Oklahoma City—Chicago, Rock Island & Pacific R.R. Co., La Salle St. Sta., Chicago, Ill., W. H. Peterson, ch. engr., 1 span 320 ft. rein.-con. subway at Robinson St., to Fox Constr. Co., El Reno, $200,000. Noted June 19.

DAMS

PROPOSED WORK

Calif., Watsonville—See "Waterworks."

PIERS AND WHARVES

PROPOSED WORK

Calif., San Francisco—PIERS, etc.—California State Harbor Comn., Ferry Bldg., sketches steel, stucco bulkhead building, $50,000: Pier 39, extending Pier 38, constructing steel frame shed, $100,000. F. G. White, Ferry Bldg., engr.

N. J., Bradley Beach—Bd. Boro Comrs., Boro Hall, will not build timber, concrete pier on ocean front. $25,000. Project abandoned. Noted Nov. 13.

N. J., Brielle—H. L. Hoffman, 100 ft. and 150 ft. timber piers, 320 ft. timber bulkheads on Manasquan River. $25,000. G. R. Moore, 603 Mattison Ave., Asbury Park, engr. Noted May 28.

R. I., Providence — State, Harbor Comn., H. E. Winson, chn., preparing plans and takes bids in July, state pier, warehouse, Allens Ave. Total est. $350,000, incl. improvements. P. Sarle, 95 Fountain St., engr. Noted Mar. 26.

BIDS ASKED

Calif., San Diego—PIER—July 13, by Superintendent Purch. Dpt., improving Broadway Pier, incl. altering freight sheds and offices, constructing passenger and freight depot, for Common Council. $175,000. A. V. Goeddel, Pacific Bldg., purch. agt.

Calif., San Francisco—PIER—July 1, by B. P. Lamb, secy. City Park Comn. (1st unit), recreation pier at Aquatic Park, incl. rein.-con. pile pier, with 300 ft. concrete deck, 60 ft. wide, foot of Van Ness Ave.

CONTRACTS AWARDED

Tex., Houston—Harris Co. Navigation Dist., c/o J. R. Wait, secy., 83 x 600 ft., rein.-con. wharf and shed, rein.-con. walls, piling, footings, slabs, etc., Ship Channel, to J. S. Harrison Constr. Co., Box 1402, Waco, $77,990. Est. $175,000. Noted June 15 Daily.

AIRPORTS

PROPOSED WORK

Tex., Laredo—City, c/o A. Martin, mayor, and A. A. McFarland, representative Amer. Auto Assn., municipal airport and automobile speedway, on 364 acre tract, near here.

N. J., Bloomfield—City Council will not build incinerator. $25,000. Project abandoned. Noted Apr. 2.

POWER AND LIGHTING

PROPOSED WORK

Colo., Colorado Springs—City Council, c/o E. L. Mosley, city mgr., extending gas mains in Cheyenne Dist. $150,000.

N. J., Ventnor—Bd. City Council, City Hall traffic lighting system on Ventnor and Atlantic Aves. $25,000. **Maturity probably soon.** E. D. Rightmire, 530 Guarantee Trust Bldg., Atlantic City, engr.

Okla., Lamont — Oklahoma Gas & Electric Co., Insurance Bldg., Oklahoma City, granted franchise electric distribution system. $30,000. Bvllesby Eng. Co., 231 South La Salle St., Chicago, Ill., engrs. Noted May 14.

Tex., Borger—City, new gas distributing system, booster station. $140,000. E. L. Lantron & W. A. Huffman, Borger, seeking new franchise. W. P. Miser, 2223 B Polk St., Amarillo, city engr.

BIDS ASKED

New York—June 30, by J. J. Dorman, fire comr., Fire Dpt., Municipal Bldg., New York, underground fire alarm system Feeder "A" and Forest Hills improvement, Queens Boro portion underground fire alarm system Forest Hills, concentrating subways in vicinity Woodhaven Blvd. between Myrtle and Metropolitan Aves., Queens Boro (post, manhole, conduit installation only).

N. Y., New York—July 21, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., furnishing, installing power equipment for Concourse line of Independent System City-Owned Railroads, Manhattan and Bronx Boros.

PARKS AND SPORTS

PROPOSED WORK

Calif., Pomona—Bd. Comrs. Los Angeles Co. (Los Angeles), rejected bids June 8, 142 x 420 ft., steel, concrete grand-stand, 79 ft. high, 10,300 seating capacity, at County Fair Grounds, $240,000. K. Muck, Hall of Records Bldg., Los Angeles, archt. Noted Mar. 26.

N. J., Bayonne—Bd. City Comrs., City Hall, grading, sodding, filling, concrete walks, at recreational center. $200,000. W. Clarkson, city engr.

N. J., Freehold—Bd. Freeholders Monmouth Co., Court House, swimming pool, on Lake Topanemus. $25,000. **Maturity probably soon.** G. K. Allen, 60 Broad St., Red Bank, co. engr.

N. J., Newark—Bd. City Comrs., City Hall, 1 story, basement, brick, steel public bath building addition, Paterson St. and Wilson Ave. $150,000. Bids in. Project in abeyance. J. B. Acocella, 9 Clinton St., archt. Noted Apr. 24.

N. J., Trenton—State Bd. Educ., State House, concrete, tile swimming pool, at State Teachers College grounds, in Hillwood Lakes Sect. $50,000. Div. Architecture & Constr., State House Annex, archts.

N. Y., New York—University Club, 1-3 West 54th St., reconstructing roof, for squash courts, golf driving school and sports gallery, 1 West 54th St. $30,000. McKim, Mead & White, 101 Park Ave., archts.

Tex., Amarillo — Tri-State Fair Assn. (1st unit) 320 x 540 ft. coliseum, 100 ft. tower, 1 story, 180 x 400 ft. arena. E. M. Stanley, Amarillo, engr.

BIDS ASKED

Calif., Berkeley—Bd. Regents University of California bids about June 26, rein.-con. track stadium bowl, 20,000 seating capacity. $200,000.

N. J., Paterson—Bd. City Comrs., City Hall, bids about July 15, concrete stadium, 7,500 seating capacity, at Monument Heights. $100,000. Fanning & Shaw, 49 Ward St., engrs. Noted May 21.

New York — July 16, by Allegany State Park Comn., Red House, bath buildings at Lake Erie State Park, Chautauqua Co. and in Allegany State Park, Cattaraugus Co.

N. Y., Brooklyn—June 30, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, completing field house and comfort station in W. E. Kelly Memorial Park, Avenue S near East 14th St.; storm water drains in section Marine Park, North of Avenue U.

N. Y., Brooklyn—Young Israel Synagogue, 50th St. and West 14th Ave., bids about Aug. 1, 2 story, 42 x 80 ft. pool, baths, 50th St. and West 14th Ave. $40,000. Slee & Bryson, 16 Court St., archts. Noted June 18.

N. Y., New York—June 30, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, altering drainage water supply, walk pavements, stationary artificial granite benches, new fences, Union Square Park; wrought iron picket fence along westerly sidewalk Harlem River Driveway, north of Washington Bridge; installing handball courts in John Jay Park, Chelsea Park, Hamilton Pl. Playground, and Heckscher Playground in Central Park, all foregoing Manhattan Boro; improving park plots at various street intersections; erecting steel pipe frame canopies over existing swings and steel pipe frame shade pavilions in playgrounds at Mosholu Parkway, St. Mary's Park and Crotona Park W., all foregoing Bronx Boro.

N. Y., Rockaway Beach—June 30, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, bathing pavilion in Jacob Riis Park. Noted Mar. 5.

CONTRACTS AWARDED

N. H., Salem — New Hampshire Breeders Assn., Inc., W. H. Gallagher, pres., race track and roadwork at Rockingham Park, to Central Constr. Co., 316 Essex St., Lawrence, Mass.; stable, to Consolidated Constr. Co., 43 Tremont St., Boston, Mass. Est. $25,000 or more.

N. Y., Brooklyn—Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., New York, hydraulic fill, 2nd Sect. Marine Park, to National Dredging Co., 233 Bway., New York, $381,345; comfort station at Owls Head Park, to K. W. Hanson, $16,700; improving Lincoln Terrace Park, to A. DiGeronimo, 1974 East 1st St., $29,474. Grand total $42,519. Noted June 4.

N. Y., New York—Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, improving portion St. Nicholas Park south of 130th St., to T. O'Dowd, 2056 Washington Ave., $26,639.

HEATING AND VENTILATING

PROPOSED WORK

Vt., Bennington—State, State House, soon takes bids heating plant in Soldier's Home, $40,000. A. Kellogg, 585 Boylston St., Boston, Mass., engr. F. L. Austin, 240 College St., Burlington, Vt., archt. Noted May 14.

BIDS ASKED

Ind., Greensburg—See "Contracts Awarded."

CONTRACTS AWARDED

Ind., Greensburg—Odd Fellows Home, brick, steel heating plant, new plumbing, freight elevator, separate contracts, $40,000. C. E. Bacon, 606 Odd Fellows Bldg., Indianapolis, archt.

N. J., Bound Brook — Bakelite Corp., 247 Park Ave., New York, furnishing, installing heating work in 12 factory buildings, to B. F. Shaw, 2nd and Lombard Sts., Wilmington, Del. Est. $25,000 or more. Noted Apr. 9.

UNCLASSIFIED

PROPOSED WORK

La., New Orleans—COTTON WHARF EXTENSION—Bd. Port Comrs., New Court Bldg., 200 ft. extension to Charbonnet Street Wharf. To exceed $125,000. Federal Barge Line, New Orleans, lessee.

Mass., Revere — OIL STORAGE PLANT—Owner, c/o Boston Port Development Co., F. T. Leahy, 1 Court St., Boston, plant, Chelsea Creek, $50,000 or more. Private plans.

N. H., Laconia—COAL SHEDS, etc.—State Laconia State School, soon takes bids coal sheds, concrete track hoppers at State School, $25,000 or more. H. H. Owens, 3 North State St., Concord, archt.

N. J., West New York—WIDENING—Bd. City Council, Municipal Bldg., revised preliminary plans widening, grading, sanitary and storm sewers, water, gas connections, curbing, concrete sidewalks, paving Bway. north of 23rd St. to Guttenburg. $30,000. F. Oleri, 650 Bergenline Ave., town engr. Noted Apr. 23.

R. I., Pawtucket — SPUR TRACK, etc. — Anaconda Wire & Cable Co., c/o E. B. Whipple, engr., 87 Weybosset St., Providence, preliminary plans spur track and pipe line, Main St. $25,000 or more.

Texas and Louisiana—PIPE LINE—Humble Oil & Refining Co., Humble, and Longview, Tex., 175 mi. 10 in. bell joint main pipe line between Longview, Tex. and Shreveport, La., incl. gathering lines. $1,350,000. Private plans.

Utah, American Fork—TRAMWAY—Amer. Smelting & Refining Co., McCormick Bldg., Salt Lake City, building 4 mi. mine tramway, A. H. Means, 1283 E St., Salt Lake City, engr.

Ont., East View—COAL PLANT—Canadian Impvt. Coal Corp., Ltd., J. Cameron, secy., coal plant. $50,000.

Ont., Goderich—GRAVEL HANDLING PLANT—J. Nicholson, Goderich, rebuilding hydraulic dredge and installing Diesel engines, electric generator and gravel handling plant.

BIDS ASKED

Idaho, Lewiston — GAS GENERATOR and HOLDER—See "Contracts Awarded."

N. Y., Brooklyn—BOARDWALK—July 1, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, relaying section Riegelmann Boardwalk, Coney Island.

N. Y., Brooklyn—RECTIFIER STATIONS—July 3, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, underground rectifier station in 6th Ave. south of 9th St. and finish work in other rectifier stations at Smith St. south of Livingston St., Smith St. north of State St., Baltic and Smith Sts., Prospect Park West at 9th St., Prospect Park West at 13th St., Prospect Ave. near Seeley St., Gravesend Ave. at Avenue C and East 2nd St. at Caton Ave., Group 4.

Tex., Houston—SHED—July 15, by Houston Port Comn., c/o R. Waite, dir., 125 x 580 ft., all steel shed, Ship Channel.

CONTRACTS AWARDED

Calif., Glendale — PIPE LINE — Southern California Gas Co., 950 South Bway., Los Angeles, welding 106 mi. 26 in. gas pipe line between city and point near Valve 32 on Taft-Los Angeles Line, to Welding Eng. Co., Bartlesville, Okla., $125,000.

Conn., New Haven—COMFORT STATIONS—Yale Athletic Assn., Yale University, eight 1 story, 25 x 70 ft. comfort stations at Yale Bowl, to Dwight Building Co., 67 Church St. Est. $25,000 or more. Noted June 4.

Idaho, Lewiston — GAS GENERATOR and HOLDER—Northwest Cities Gas Co., gas generator, holder, day labor. $100,000.

N. H., Concord—TUNNEL—State, concrete underground tunnel, covered passageway, to L. Marion, 104 Martin St., Lowell, Mass., $12,900. Noted June 4.

N. Y., Pine Aire Station — HOSPITAL EQUIPMENT — Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, equipment for Buildings 8 and 13 (Dining and Kitchen Buildings), to S. Blickman, 536 Gregory Ave., Weehawken, N. J., $67,740. Noted Apr. 30.

N. Y., Batavia—TUNNELS—Superintendent Standards & Purchase, Capitol, Albany, service tunnels for New York State School for Blind.

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Unclassified (Continued)

to L. C. Whitford, Wellsville, $16,200; heating, to Lare & Creelman, 74 Exchange St., Rochester, $8,669. Noted May 28.

MATERIALS

BIDS ASKED

WATER PIPE, etc.—Vallejo, Calif.—A. E. Edgcumbe, city clk., taking bids 16, 20 and 24 in. B and S water pipe and fittings.

CLAY, GRAVEL, LUMBER, etc.—Mississippi—July 1 by State Hy. Comm., Jackson, 1,065,000 units clay and gravel 1 mi. haul, 58,500 cu.yd. washed gravel 1 mi. haul, 198,500 cu.yd. clay gravel 1 mi. haul, 36,500 cu.yd. clay gravel 1 mi. haul, loaded, hauled, distributed; also creosoted lumber, creosoted piling Z.M.A. and wolmanized lumber. C. M. Williamson, dir.

LUMBER, POSTS, etc.—Holly Springs, Miss.—July 6, by Road Comrs. Marshall Co., 22,500 bd.ft. lumber, 126 posts 10 ft. long, 54 posts 12 ft. long, 51 posts 22 ft. long, 352 ft. 24 in. corrugated metal culverts, 282 ft. 10 in. metal culverts. S. W. McClesky, Holly Springs, engr.

PORTLAND CEMENT — Brooklyn, N. Y. — July 1, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, 4,000 bbl. portland cement; 3,000 cu.yd. 1 and 1½ in. coarse aggregate, broken stone or gravel.

ASPHALT SAND—New York, N. Y.—June 30, by S. Levy, pres. Manhattan Boro, Municipal Bldg., 3,000 cu.yd. asphalt sand.

TAR—New York, N. Y.—July 2, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Ave., 100,000 gal. tar for patching, hot application.

STEEL SHEET PILING—Beaumont, Tex.—City taking bids 650 tons steel sheet piling. R. C. Black, City engr.

ASPHALTIC MIXTURE — Montreal, Que. — City in market 50,000 tons asphaltic mixture.

CONTRACTS AWARDED

PIPE—Hartford, Conn.—City, Metropolitan Water Dist., various sizes centrifugally and pit cast pipe and accessories, to American Cast Iron Pipe Co., 2930 North 16th St., Birmingham, Ala., $18,306.

PIPE—Chicago, Ill.—City, Hall, 5,229 tons 30, 36 and 48 in. c.i. pipe, to U. S. Cast Iron Pipe & Fdry. Co., 122 South Michigan Blvd., at $40.75 per ton, total $213,081; 444 tons 36 in. pipe, to J. B. Clow & Co., North Talman Ave. and West Lake St., $40.65 per ton, total $18,049.

WATER PIPE—Chicago, Ill.—Dpt. P. Wks., City Hall, A. A. Sprague, comr., 400 tons 6 in., 855 tons 8 in. and 394 tons 12 in. c.i. water pipe, to Alabama Pipe Co., 122 South Michigan Blvd., $66,125; 570 tons 8 in. and 493 tons 12 in. c.i. pipe, to Glamorgan Pipe & Fdry. Co., 122 South Michigan Blvd., $42,360; 788 tons 12 in. c.i. pipe, to Lynchburg Fdry. Co., 122 South Michigan Blvd., $31,756; 788 tons 12 in., to J. B. Clow & Son, North Talman Ave. and West Lake St., $32,150. Grand total $172,392.

CONTROL VALVES — Detroit, Mich. — Bd. Water Comrs., 735 Randolph St., 6 control valves for emergency intake for water supply, to Goslin-Birmingham Mfg. Co., 800 North 35th St., Birmingham, Ala., $15,980. Noted May 7.

CEMENT—New York, N. Y.—S. Levy, pres. Manhattan Boro, Municipal Bldg., 25,000 bags portland cement, to J. A. McCarthy, 479 Walton Ave., $10,500. Noted June 4.

STEEL PIPE, etc.—Vancouver, B. C.—City Council, 4,200 ft. seamless pipe, to Alcock, Downing & Wright Ltd., 896 Cambie St., $17,-692; 7,300 ft. 30 in. electrically welded pipe, to Vancouver Eng. Wks., Ltd., 519 West 6th Ave., $43,015. Noted May 21.

EQUIPMENT

BIDS ASKED

GRADER — Mankato, Minn. — June 30, by B. E. Lee, and Blue Earth Co., 1 motor patrol grader. C. J. Swift, co. hy. engr.

FOREIGN

Egypt, Cairo—Aug. 1, by Dpt. P. Wks., supplying, erecting pumps, motors, press filters, settling tanks, water distributing pumps and accessories at EDFU Power Station.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Illinois—National Autohaven Co., 201 North Wells St., Chicago, will not build tourists hotels, repair shops, etc., in various cities. Company under investigation. Noted June 4 under "Bids Asked."

Mass., Lynn—June 29 (extended date), by Hotel Lenox, V. M. Kavanaugh, pres., 71 Spencer St., 3 story, 90 x 140 ft. brick, steel hotel, office, store, Exchange and Broad Sts. $150,000 or more. G. A. Cornet, 14 Central Ave., archt. Noted June 18.

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N. J., Hoboken—S. Kassel, 3 Potter Pl., Weehawken, taking bids general and separate contracts rebuilding 5 story, basement, brick, steel, 819 Park Ave., recently destroyed by fire. $150,000. F. Perna, 68 Hudson St., Hoboken, archt.

N. J., Morristown—J. D. Allen, archt., 85 Harrison Ave., West Orange, taking bids general contract 3 story, basement, 75 x 100 ft., brick, steel hotel, store, for Neumark & Schlosser, c/o architect. $150,000.

N. J., Jersey City—See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

Tex., Dallas—See "Contracts Awarded."

CONTRACTS AWARDED

N. J., Jersey City—Eighty Palisade Constr. Co., M. M. Kramer, 294 Stegman Parkway, 4 story, basement, 50 & 100 ft., brick, steel, 80-82 Palisade Ave., separate contracts. $150,000. M. Kraut, 3010 Hudson Blvd., archt.

N. Y., New York—Stuyvesant Housing Corp., H. Schurmacher, pres., 415 Lexington Ave., 6 story apartment, 439 East 15th St., separate contracts. $500,000. H. Ginsberg, 205 East 42nd St., archt.

N. Y., White Plains—Van Dorn Syndicate, c/o Rostenberg Realty Co., 23 Orawaiysum St., bids probably in fall, general and separate contracts, Mamaroneck Ave. near Maple Ave. $500,000.

Tex., Dallas—Yonack Bros., c/o Plaza Hotel, 4 story, 50 x 100 ft., brick, steel hotel addition, Commerce and Jefferson Sts., separate contracts. H. M. Bernet, Melba Bldg., archt.

CLUBS

PROPOSED WORK

N. J., Jersey City — Knights of Columbus Council 137, 441 Jersey Ave., revised sketches by Kelly & Cowan, 921 Bergen Ave., 3 story, basement, brick, steel club house. $200,000. Noted Feb. 26.

BIDS ASKED

N. J., Newark—F. H. Koenigsberger, archt., 48 Walnut St., bids about Aug. 1, general contract 2 story, basement, brick, steel club, market, Washington and Linden Sts. $150,000. Noted June 11.

Pa., Erie — June 29, by Meyers & Johnson, archts., Commerce Bldg., 7 story, 50 x 100 ft., brick, steel rear addition, incl. kitchen, showers, sun bath, office, 31 West 10th St., for Y. M. C. A., 31 West 10th St., O. C. Hitchcock, pres.

CONTRACTS AWARDED

Ia., Waterloo—Y. M. C. A., c/o S. A. Cohagen, genl. secy., 3 and 4 story, basement, 120 x 130 ft., brick, rein.-con., to H. A. Maine, 305 Marsh Place Bldg., $167,300; heating, ventilating and plumbing, to Quest & Smith, Waterloo, $35,000; tile and marble work, to Waterloo Tile & Marble Co., Inc., Waterloo, $16,530; electric wiring, to Hub Electric Co., Waterloo, $9,040. Grand total $227,879. Noted June 4.

N. H., Concord—New Hampshire Odd Fellows, H. F. Davis, chn. building com., 2 story, 35 x 185 ft., 3 wings, 35 x 85 ft., brick home, to H. P. Cummings Constr. Co., 14 Prospect St., Ware, Mass. Est. $200,000. Noted June 4.

HOSPITALS

PROPOSED WORK

Conn., Waterford—Seaside Sanitorium, State, F. Salmon, comptroller, removing Seaside Sanatorium at Niantic to here, and plan new sanatorium. To exceed $150,000. $400,000 appropriated.

Mass., Fitchburg—Burbank Hospital, C. T. Crocker, building comr., nurses home, Nichols Rd. $150,000 or more. Architect not selected.

Mich., Eloise—Wayne Co. Superintendent of Poor plans by Maul & Lentz, 1257 David Whitney Bldg., Detroit, altering and constructing 3 story, basement, brick, steel, concrete hospital addition, plain found., Michigan Ave. $350,000; plans by N. O. Gould, Empire Bldg., Detroit, 3 story, part basement, 210 x 330 ft., brick, rein.-con., H-shaped hospital addition, plain found.

N. Y., New York—Montefiore Hospital, Gunhill Rd., hospital, laboratory, $1,000,000. Project in abeyance until 1932. Kohn & Butler, 56 West 45th St., archt. Noted Apr. 23.

Wis., Milwaukee—Eschweiler & Eschweiler, archts., 210 Mason Bldg., soon let contract 4 story, 48 x 100 ft., brick, rein.-con., hospital addition, North Maryland Ave., for Columbia Hospital. Noted May 21.

BIDS ASKED

Calif., Fresno—July 14, by D. M. Barnwell, clk., Fresno Co., crippled children's unit and surgery ward, brick, stone. $150,000. Swartz & Ryland, Brix Bldg., archts. Noted Sept. 25.

Conn., Hartford—June 29, by State, Cedarcrest Sanatorium, Old Senate Chamber, Tuberculosis Comn., brick, steel nurses' home, infirmary. $207,000. Cudworth & Thompson, Disco Bldg., 257 Main St., Norwich, archts. Noted Mar. 5.

Mich., Port Huron—July 9, by Pond, Pond, Martin & Loyd, archts., 180 North Michigan Ave., Chicago, Ill., 6 story, basement, 56 ft. 2 in. x 139 ft., brick, steel, cut stone hospital, for Port Huron Hospital Assn. $300,000. Noted Mar. 12.

N. J., Preakness—July 29, by Bd. Freeholders Passaic Co., Court House, Paterson, general contract, steel, ornamental iron, plumbing, heating, electrical work for 3 story basement, brick, steel welfare house, Oldham Rd. $750,000. F. W. Wentworth, 140 Market St., Paterson, archt. Noted June 18.

CONTRACTS AWARDED

Miss., Jackson—State Insane Hospital Removal Comn., C. Gordon, secy., Tuberculosis Building, to W. J. McGee & Son, Jackson, $89,620; superintendent's home and doctor's apartment, to Kershaw Constr. Co., Woodward Bldg., Birmingham, Ala., $26,600 and $47,400 respectively; patients' cottages, Type A-2, to M. T. Reed Constr. Co., Belzoni, $33,793, Types A-3 and A-4, to Garber & Dixon, Jackson, $34,232 each; entrance structures, to W. C. Salley, Monroe, La., $4,889; concrete drain to lake, to Miller Hutchinson Co., New Orleans, La., $18,300. Grand total $289,066.

N. J., Browns Mills—Jewish Relief Society, 763 Broad St., Newark, general contract, Deborah Sanitarium and Power Plant, 4 story, basement, 50 x 145 ft., brick, steel, to J. and B. Friedman Inc., 25 West 45th St., New York. Est. $600,000. Noted May 28.

N. J., Holmdel—Dpt. Institutions & Agencies, State Office Bldg., Trenton, general contract nurses' home, to C. R. Hedden, 375 South Orange St., Newark, $186,800; plumbing, to G. J. Tobin, 187 North Ave., Plainfield, $16,289; heating, to Buist & Son, 178 George St., $21,-700; electrical work, to Brown Electric Co., South Broad St., Trenton, $5,846; structural steel, to Jersey Steel Co., Trenton Trust Bldg., Trenton, $24,649. Grand total $255,284. Noted June 11.

N. J., Morris Plains — Dpt. Institutions & Agencies, State Office Bldg., Trenton, general contract 3 story, basement, 55 x 130 ft., brick, steel attendant's building, New Jersey State Hospital grounds, to F. LaFerrara, 308 Rhode Island Ave., East Orange. Est. $150,000.

Wis., Wauwatosa—St. Camillus Monastery, 611 South 26th St., 3 story, 35 x 250 ft., brick hospital, Blue Mound, to T. Imbs, 1661 West Wisconsin Ave., Milwaukee. $185,000.

CHURCHES

PROPOSED WORK

Conn., Hartford—Memorial Baptist Church, N. P. Clark, chn. Building Comn., plans by Isaac A. Allen & Son, 100 Farmington Ave., Colonial type, brick, stone church and steeple, Fairfield St. $150,000.

N. J., Guttenburg—Little Church on the Hill, 326 24th St., 2 story, basement, 50 x 100 ft., brick, steel church, Bergenline Ave. and 24th St. $150,000. Bids in. Project in abeyance. W. G. Bartels, 270 Main St., Hackensack, archt. Noted Apr. 30.

N. J., Union City—St. Michael's Monastery, 381 West St., will not alter 4 story, basement, monastery, West St. $150,000. Project abandoned. Noted Feb. 26.

N. Y., New York—Church of St. Roch, Wales Ave. near 149th St., bids latter part July, general contract church, rectory, Wales Ave. near 149th St. $175,000. DePace & Juster, 151 West 46th St., archts.

N. Y., New York—New York City Baptist Mission Society, 276 5th Ave., church, apartment, 162 2nd Ave. $1,100,000. **Maturity about December.** E. Roth, 1440 Bway., archt. Noted Mar. 7, 1929, under "Contracts Awarded."

R. I., Warwick—Methodist Episcopal Church plans by Woodbury & Stuart, 581 Boylston St., Boston, Mass., 1 story, basement, brick, stone, Ann and Fair Sts. $150,000.

CONTRACTS AWARDED

Conn., Hartford — St. Augustine's Roman Catholic Parish, M. W. Barry, pastor, two 1 story, 12 x 125 ft. stone church additions, to Ahern Welch Co., 1 Webster St. Est. $150,000. Noted June 11.

Ind., Oldenburg—Franciscan Fathers Catholic Church, 2 story, basement, 60 x 135 ft., brick steel school, to W. A. Gutzwiller, Batesville. Est. $150,000. Noted June 4.

N. J., Jersey City—Church of Our Lady of Sorrows, E. Monteleone, pastor, 75 Claremont Ave., general contract 2 story, basement, 80 x 105 ft., brick, steel school, rectory, to Auriemma & Macchi, 1765 Hudson Blvd. Est. $150,000. Noted May 13.

N. J., Newark—Roman Catholic Diocese, 22 Mulberry St., general contract 4 story, basement, 60 x 65 ft., brick, steel chancery building, 31 Mulberry St., to James Mitchell, Inc., 24 Journal Sq., Jersey City. Est. $150,000. Noted June 4.

SCHOOLS

PROPOSED WORK

Ark., Fayetteville—University of Arkansas, c/o Bd. Trustees, soon takes bids 2 and 6 story, basement, concrete, brick, stone library, Haralson & Nelson, 407 Merchants Natl. Bank Bldg., Ft. Smith, archts., Jamieson & Spearl, 1116 Arcade Bldg., St. Louis, Mo., assoc. archts., plans by Wittenberg & Deloney archts., Home Insurance Bldg., Little Rock, and Jamieson & Spearl, assoc. archts., 1116 Arcade Bldg., St. Louis, Mo., 3 story, basement, concrete, brick, stone science building. $425,000.

Conn., Hartford—City, West Middle School Dist., F. B. Merrels, plans by Malmfeldt, Adams & Prentice, 15 Lewis St., school, gymnasium, Whitney and Cone Sts. $150,000 or more.

Schools (Continued)

Ill., Chicago—Northwestern University, Evanston, revised plans by Childs & Smith, 720 North Michigan Ave., Chicago, 1 story, steel, stone, 1,050 seating capacity, Chicago Ave. and Lake Shore Dr., $300,000.

Ill., Elgin—Bd. Educ. plans by W. B. Ittner, 911 Locust St., St. Louis, Mo., elementary school, Du Bois Ave., Van and Shuler Sts. $150,000 bonds voted.

Ill., Evanston — Northwestern University, sketches by James Gamble Rogers, 156 East 46th St., New York, and Childs & Smith, assoc. archts., 720 North Michigan Ave., Chicago, music hall, on campus. $1,000,000.

Ind., Muncie — Ball State Teachers College plans by G. Schreiber, 801 Architects Bldg., Indianapolis, rein.-con., brick, steel, stone college, incl. library, assembly hall additions, $150,000.

Ind., South Bend — Notre Dame University sketches by M. B. Carroll, 713 Linwood Blvd., Knute Rockne Memorial Fieldhouse, on campus, $1,000,000.

Kan., Colby—Bd. Educ., H. A. Herald, secy., plans by Mann & Co., 721-22 Rorabaugh-Wiley Bldg., Hutchinson, concrete, brick high school, $150,000. Project held up due to opposition. Noted June 18.

Mass., Andover—Town, School Comm., brick school, Bartlett St. $150,000 or more. Architect not selected.

Mass., Arlington — Town, Bd. Selectmen, sketches by R. C. Sturgis, 120 Boylston St., Boston, 2 story, basement, brick, steel, plain found., Pleasant Ave., Sect. $250,000.

Mass., Brighton (sta. Boston)—City of Boston, Dpt. School Buildings, soon takes bids 2 story, basement, brick, limestone, steel intermediate school, concrete found., Kendrick St., Bennet Dist. $600,000. Allbright & Blaney, 308 Boylston St., Boston, archts. Noted Feb. 19.

Mass., Brookline (br. Boston)—Town, C. F. Rowley, chn. Bd. Selectmen, soon takes bids 2 story, basement, brick, steel, school, plain found., Walnut St. $390,000. M. P. Meade, 80 Boylston St., Boston, archt. Noted May 26.

Mass., Cambridge—Harvard University, A. L. Lowell, pres., soon takes bids 3 story, basement, brick, stone, steel dormitory, plain found., Mt. Auburn and Plympton Sts. $400,000. Coolidge, Shepley, Bulfinch & Adams, Ames Bldg., Boston, archts. French & Hubbard, 210 South St., Boston, engrs.

Mass., Dedham — Town, Superintendent School, high school addition, Whiting Ave. $300,000 appropriated. Architect not selected.

Mass., Greenfield—Town, T. M. Hayes, chn. School Bd., 3 Bank Row, sketches by B. Dirks, 378 Main St., Springfield, Junior High School, 2 story, basement, brick, steel, plain found., Shattuck Park. $200,000. Noted June 11.

Mass., Haverhill—Sacred Heart Roman Catholic Church, J. F. Kelleher, 6 Carlton Ave., sketches by J. Flaherty, Green Harbor, Mansfield, 2 story, basement, brick school, Doane St. $150,000.

Mass., Jamaica Plain—City of Boston, Dpt. School Buildings, sketches by J. F. Cullen, 162 Newbury St., Boston, 2 story, basement, brick, stone, plain found., Francis Parkman Dist., Forest Hills. $150,000.

Mass., Lawrence—City, Mayor's Office, soon takes bids 2 story, basement, brick, stone school, plain found., Storrow and Marston Sts. $150,000. Higgins & Collins, 316 Essex St., archts. Noted May 7.

Mass., Medford (br. Boston)—City, A. Harty, City Hall, sketches by Hutchins & French, 11 Beacon St., Boston, 2 story, basement, brick school, plain found., Harvey Dist. $150,000.

Mass., Wellesley — Wellesley College, C. B. Hodges, supt. constr., E. F. Pendleton, pres., plan brick, science building to house physics, chemistry and geology departments. To exceed $150,000. Architect not selected.

Mass., Worcester—D. Eberson, archt., c/o Warner Bros. Pictures, 321 West 44th St., New York, bids after July 15, general contract Lewis J. Warner Memorial Auditorium at academy for Worcester Academy. $250,000. H. M. Warner, 1277 East 14th St., Brooklyn, N. Y., donor. Noted June 18.

N. J., Edgewater—Bd. Educ., will not build 2 story, basement high school. $150,000. Project abandoned. Architect not selected. Noted Jan. 1.

N. J., Jersey City — Holy Rosary Roman Catholic Church, F. DiPersio, pastor, 344 6th St., 2 story, basement, brick, steel school. $150,000. **Maturity probably soon.** Architect not selected.

N. J., Livingston — Bd. Educ., Livingston, sketches by Guilbert & Betelle, 20 Branford Pl., Newark, 2 story, brick, steel addition to Roosevelt School. $150,000.

N. J., Newark—Bd. Educ., City Hall, sketches by C. F. Bertrand, 222 Market St., 2 story, basement, brick, steel, rein.-con. addition, Madison Ave. School, Madison Ave. $150,000.

N. J., Newark—Bd. Educ., City Hall, plans by C. F. Bertrand, 122 Market St., 3 story, basement, brick, steel, rein.-con. addition to Peshine Ave. School, Peshine Ave. $150,000. **Maturity soon.** Noted Apr. 3.

N. J., Paterson—Bd. Educ., City Hall, School 5, 2 story, basement, brick, steel, Totowa Sect. $150,000. **Maturity probably soon.** Architect not selected.

N. J., Sayreville—Bd. Educ., 419 Main St., Junior High School, 2 story, basement, brick, steel, rein.-con. $150,000. **Maturity probably soon.** Architect not selected.

N. J., West Orange — Bd. Educ., Northfield Ave., plans by Hacker & Hacker, 201 Main St., Fort Lee, Junior High School, 3 story, basement, brick, steel, rein.-con., incl. gymnasium, auditorium, manuel training and domestic science rooms, Filbert St. $550,000. Noted May 26 Daily.

N. J., Woodbridge—Bd. Educ., Barron Ave., will not build 2 story, basement, brick, steel addition Junior High School, School St. $150,000. Project abandoned. Noted Jan. 8.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, plans by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., P. S. 131 addition, Fort Hamilton Ave. and 43rd St. $350,000.

N. Y., New York—Bd. Educ., 500 Park Ave., New York, plans by W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, P. S. 43 addition, Amsterdam Ave. and 129th St. $500,000.

Pa., Glenshaw—Bd. School Directors Shaler Twp. sketches brick, steel elementary and high school. $250,000 bonds voted. Architect not selected. Noted May 28.

Pa., Muncy (Williamsport P. O.) — Muncy School Assn., C. Woldron, pres., plans by Linoleum & Linthicum, Wash., D. C., and takes bids early in July. 2 story, basement high school, incl. auditorium, gymnasium, $200,000.

Ont., Kingston — Kingston Separate School Bd., T. E. Dolan, secy., new school, Johnston St. $160,000.

BIDS ASKED

Conn., Darien—Town, bids about July 15, general contract school, $150,000 or more. Starrett & Van Vleck, 393 7th Ave., New York, archts. Noted June 11.

Del., Marshallton—Delaware School Foundation, A. J. Taylor, vice pres., Du Pont Bldg., Wilmington, bids about Aug. 1, Marshallton Consolidated School, 2 story, basement, brick, rein.-con., steel, plain found., Brandywine Hundred Dist. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, N. J., archts. Noted June 11.

Ind., Campbellsburg—July 2, by School Comrs., brick, steel high school. $150,000. O. L. Hill, Heitger Bldg., Bedford, archt.

Ind., Elston (Lafayette P. O.)—School Comrs. bids about July 1, brick, steel, terrazzo, Township Grade School incl. auditorium, steam heating, steel stairs, slate blackboards. $150,000. F. P. Riedel, Lafayette Life Bldg., Lafayette, archt.

Ind., Evansville—June 29, by St. Anthony's Parish, 2 story, basement, 66 x 217 ft., rein.-con., steel, terrazzo, limestone, brick school, incl. steam heating plant, stage auditorium, Columbia and 2nd Sts. $150,000. E. C. Berendes, 121 Northwest 4th St., archt.

Ind., Valley Mills—July 10, by School Comrs., 2 story, basement, 64 x 196 ft. grade and high school, 1 story, 65 x 69 ft. gymnasium, brick, steel, Road 67. $150,000. C. Byfield, 923 Peoples Bank Bldg., Indianapolis, archt. Noted Feb. 19.

Kan., Wichita—July 6, by Bd. Educ., L. Gerteis, secy., 406 York Rite Temple Bldg., College Hill Intermediate School, 3 story, 170 x 230 ft., concrete, brick, steel, stone, incl. gymnasium, auditorium, cafeteria. $235,000. E. Forsblom, Central Bldg., archt. Noted May 21.

Mass., Fall River—July 1, by E. Carr, pastor, 163 Winter St., 2 story, basement, 80 x 245 ft., brick, limestone, granite school, Linden St. $200,000. Maginnis & Walsh, Statler Bldg., Boston, archts. Noted June 4.

Mass., Falmouth—June 29, by Town, A. L. Pattee, chn. Bd., 2 story, basement, brick, stone, plain found. $175,000. H. F. Kellogg, 378 Stuart St., Boston, archt. Noted Mar. 12.

Mass., Lawrence—June 29, by City Superintendent Schools, 2 story, basement, 70 x 110 ft., cast stone, elementary and kindergarten school, Park, Trenton and Lexington Sts. $150,000. Ashton, Huntress & Alter, 477 Essex St., archt. Noted May 14.

Mass., Lawrence—June 29, by Superintendent Schools, 2 story basement, 60 x 95 ft., brick, cast stone school, Broadway, Chester and Bowdoin Sts. $150,000 J. G. Morrisette, 575A Essex St., archt. Noted May 14.

Mass., Lawrence—June 29, by City Clerk, City Hall, 2 story, basement, brick school, Saratoga, Park and Bunker Hill Sts., for City, B. M. Sheriden, supt. schools. $150,000. Noted May 7.

Mass., Lawrence—June 29, by City, School Building Superintendent, 2 story, basement, 50 x 120 ft., brick, artificial stone school, Pleasant and Woodland Sts. $150,000. Higgins & Collins, 305 Central Bldg., archts. Noted June 4.

Minn., Moorhead — June 30, by State, c/o Comm. Administration & Finance, Capitol, St. Paul, 3 story, basement, 150 x 282 ft. and 120 x 140 ft. main recitation and physical education building, $420,000; 2 story, basement, 82 x 260 ft. demonstration school, $220,000; 1 story, basement, central heating plant, $125,000, all at State Teachers College, C. H. Johnston, 360 Robert St., St. Paul, archt. Noted Feb. 26.

N. Y., Ithaca — July 23, by Commissioner Education, Educ. Bldg., Albany, constructing Home Economics Building, New York State College Home Economics, Cornell University.

N. J., Linden—Bd. Educ. bids about July 15, 2 story, basement, brick, steel addition to Senior High School, St. George Ave. $410,000. H. B. Brady, Inc., 333 North Broad St., Elizabeth archts. Noted June 18.

N. J., Morristown—Bd. Educ., 50 Early St., bids about July 15, two 2 story, basement, 40 x 150 ft. additions, Speedwell Ave. $150,000. C. Voorhees, 1 Schuyler Pl., archt. Noted June 18.

N. J., Newark—Bd. Educ., City Hall, bids about Aug. 15, on revised plans Junior and Senior High School, 4 story, basement, brick, steel, Chancellor Ave. $1,080,000. Guilbert & Betelle, 20 Branford Pl., archts. Noted May 21.

N. J., Union City—Bd. Educ., F. Ortel, secy., 415 32nd St., bids about Aug. 15, 3 story, basement, 155 x 190 ft. school, West St. between 5th and 6th Sts. $750,000. J. D. Lugosch, 714 Bergenline Ave., archt. Noted May 28.

N. Y., College Point — June 30, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, general contract P. S. 129, 7th and 9th Aves., 129th and 128th Sts., for Bd. Educ., 500 Park Ave., New York. Noted June 4.

N. Y., Warwick—July 15, by Commissioner Social Welfare at State Office Bldg., 25 buildings and service connections at New York State Training School for Boys. Former bids rejected. Noted Mar. 26.

O., Dayton — July 14, by Bd. Educ., C. J. Schmidt, clk., Ludlow Bldg., 3 story, basement, brick, rein.-con. school, incl. auditorium, plain found., Summitt St. $250,000. Hermann & Brown, Reibold Bldg., archts. Noted Feb. 5.

Pa., Phila.—July 3, by Thomas Martin & Kirkpatrick, archts., Architect Bldg., 1 story, basement, gallery, 150 x 183 ft., steel, limestone, granite chapel, plain found., Colleges and Corinthian Sts., for Girard College, C. A. Herrick, Pres.

Tex., Galveston—Giesecke & Harris, archts., Norwood Bldg., Austin, taking bids Junior High School, 2 story, 500 ft. long, 2 wings, 180 ft. each, brick, rein.-con., incl. 25 x 70 ft. gymnasium, plain found. $300,000. R. R. Rapp, Guaranty Bldg., Galveston, archt. Noted Feb. 19.

Wis., Whitefish Bay—July 6, by School Bd. and H. W. Tullgren, archt., 1234 North Prospect St., Milwaukee, 3 story, 80 x 260 ft. high school, and 1 story, 106 x 120 ft. gymnasium, brick, steel, Ardmore St.

CONTRACTS AWARDED

Ill., East St. Louis—East St. Louis Catholic High School Bd., c/o Diocesan Bd. Educ., H. Altoff, pres., Belleville, 3 storey, basement, 94 x 75 ft., rein.-con., brick, to J. J. Keeley, Jr., 4114 State St.; plumbing, to McEvilly & Flynn, 700 St. Clair Ave.; heating, to Elliott & Barry Eng. Co., 4060 West Pine Blvd., St. Louis, Mo.; electrical work, to Weekmeyer Electric Co., 2133 Illinois Ave. Noted June 11.

Ind., Buckskin — School Comrs. Gibson Co., general contract brick, steel stone school, to J. Klingensmith, Washington. Est. $150,000. Noted May 21.

Ind., Mackey—School Comrs., general contract 2 story, basement, 60 x 104 ft., rein.-con., brick, stone grade and high school, to J. A. Keller & Son, Vincennes. Est. $150,000. Noted May 21.

Ind., Somerville—School Comrs., general contract brick, steel, stone school, to W. A. Armstrong, 2426 1st Ave., Terra Haute. Est. $150,000. Noted May 21.

Mass., South Hadley — Town, A. Kjoller, School Bd., 2 story, basement, 35 x 45 ft. and 60 x 115 ft., brick, artificial stone school, to M. J. Walsh & Sons, 1412 Dwight St., Holyoke. Est. $150,000. Noted June 4.

Mass., Weston—Town, Superintendent Schools, 3 story, basement, brick, steel school, to I. P. Rocheford, 24 Union Ave., Boston, est. $225,000; heating and plumbing, to A. J. Colpitts, Central Ave., est. exceeds $25,000. Noted June 4.

Mich., Olivet—Olivet College, 3 story, part basement, brick, steel, stone dormitory, plain found., campus, to O. F. Miller Co., Kalamazoo. Est. $200,000.

Mont., Great Falls—Ursuline Convent of Holy Family, 4 story, basement, 60 x 326 ft., rein.-con., brick, terra cotta, to J. E. Beaulaurier, Great Falls. Est. $300,000. Noted Sept. 25.

N. H., Andover—Proctor Academy, C. B. Wetherell, headmaster, Andover, 2 story, basement, brick school, dormitory, to H. C. Stanley, New London. Est. $150,000. Noted June 18.

N. Y., Brooklyn — St. Patrick's Roman Catholic Church, J. J. Kent, pastor, 95th St. and 4th Ave., altering 3 story school, to Sobray-Whitcomb Co., 105 West 40th St., New York. Est. $150,000. Contractor taking bids on separate contracts. Noted June 4.

Pa., Irwin — Bd. Educ., C. Drake, pres., Altoona, general contract 2 story, part basement, 121 x 187 ft., elementary and junior high school, Chestnut St., to M. Thomas, Blairsville, $91,590; plumbing, to W. M. Clarke Co., 297 Beaver St., New Castle, $9,278; electric wiring, to J. B. Finn, Hollidaysburg, $6,890; heating and ventilating, to Mulch Bros., Hollidaysburg, $22,149. Grand total $129,907. Noted May 28.

Pa., Souderton—Bd. Educ., general contract 2 story, basement, 145 x 160 ft., brick, steel high school, plain found., to H. H. Ninninger, Souderton, $160,000. Noted June 4.

Wyo., Rock Springs—Bd. Educ., Sweetwater School Dist. 4, high school, to Kellogg Lumber Co., Rock Springs, $247,000. Noted June 4 Daily.

Ont., Woodstock — Collegiate Institute, 3 story, 80 x 120 ft., brick, steel addition to collegiate institute, physics and chemistry laboratories to be equipped, to Stuart Bros., 15 Hyde Park Ave., Hamilton, $161,000.

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THEATRES

PROPOSED WORK

Mass., Gardner—L. G. McKnight, 324 Main St., brick, steel theatre. Main St. $125,000-$150,000. Architect not selected.

Mass., Worcester — Fox New England Theatres, 444 West 56th St., New York, and 30 Church St., New Haven, Conn., theatre. Architect not selected. **Maturity about December.** Noted June 11.

N. J., Red Bank—Red Bank Amusement Co., c/o Boylan & Levine, archts., 143 Albany St., New Brunswick, revised sketches 2 story, basement, brick, steel theatre. $200,000. Noted Mar. 19.

N. Y., New York — Bethlehem Eng. Corp., 1560 Bway., theatre, 8th Ave. and 42nd St. $900,000. **Maturity in fall.** R.K.O. Theatres, 1564 Bway., lessee. Noted June 4.

BIDS ASKED

Ont., Oshawa—C. C. Stenhouse, archt., Royal Bank Bldg., bids about Sept. 1, brick, steel theater, plain found., Simcoe St., for Syndicate Builders Ltd., 116 Brock St. E. $225,000.

CONTRACTS AWARDED

Calif., Alameda—Miller & Pflueger, archts., 580 Market St., San Francisco, steel, rein.-con. theatre, to Mittry Bros. Constr. Co., Inc., 412 West 6th St., Los Angeles, for Alameda Amusement Co., c/o architects. $150,000. Noted May 14.

BANKS

CONTRACTS AWARDED

Mass., Lynn—Essex Trust Co., H. M. Kelley, pres., altering and constructing 1 story, basement, brick, stone, concrete, steel addition, concrete found., to J. T. Wilson & Son, 67 Spring Rd., Nahant. Est. $150,000.

OFFICES

PROPOSED WORK

Calif., San Francisco—L. R. Lurie, 315 Montgomery St., plans by O'Brien Bros. & Peugh, 315 Montgomery St., 10 story, Class A office, Montgomery St. $150,000 or more.

Conn., Greenwich — A. V. Salvatore, 244 Greenwich Ave., plans by Goggins & Hedlander, 45 East Putnam Ave., 3 story, 75 x 125 ft., brick, steel, limestone, office, store, Sherwood St. and Putnam Ave. $150,000.

N. Y., New York—W. F. Chatles, 369 Lexington Ave., plans by L. F. Kunst, 369 Lexington Ave., altering office and showroom, incl. elevator, plumbing, mechanical equipment, 363 Lexington Ave. $45,000.

CONTRACTS AWARDED

N. J., Newark—F. A. Phelps, archt., 21 Fulton St., Newark, general contract 2 story, basement, 40 x 80 x 100 ft. office, to E. M. Waldron Inc., 40 Park Pl. Est. $250,000. Noted May 20.

STORES

PROPOSED WORK

Conn., Greenwich—See "Offices."

Conn., Waterbury—Grevet, Bossit & Holland, Inc., altering and constructing 2 and 3 story, basement, irregular sized, brick, steel, concrete department store addition, North Main St. and Phoenix Ave. $150,000. Project postponed for 1 year. W. E. Hunt, 182 Church St., Torrington, archt. Noted Mar. 26.

Mo., University City—L. E. Seegal, 6701 Clayton Ave., Clayton, 2 story, basement, 120 x 140 ft., concrete, brick store, apartment, Pershing and Perdue Aves.

N. J., East Orange—M. Keating, c/o Mahnken & Schultz, 256 Summit Ave., Union City, bids in August, general contract 2 story, basement, brick, steel store, apartment, Central Ave. $150,000. Noted June 18.

N. J., Newark—One Thousand One Hundred Fourteen Broad Street Corp., A. M. Slavitt & D. Cronheim, 39 Branford Pl., 3 story, basement, brick, steel store, office, 1014 Broad St. $150,000. Bids in. Project in abeyance. Bottelli & Bottelli, 45 Branford Pl., archts. Noted Apr. 30.

N. J., Paterson—R. Cannizzaro & A. Ferenciclo, 75 Cross St., will not build 2 story, basement, brick, steel store, apartment, Mill and Grand Sts. $150,000. Project abandoned. J. Bellomo, 6 Park Ave., archt. Noted June 4.

N. J., Union City—W. P. Keane, 317 Monastery Pl., plans by P. A. Vivarttas, 110 48th St., 2 story, basement, 75 x 100 ft., brick, steel stores, office, Bergenline Ave. and 36th St. $150,000. Noted June 18.

BIDS ASKED

N. J., East Orange—Owner, c/o E. C. Epple, archt., 17 Washington St., Newark, bids about Aug. 1, general contract 2 story, basement, brick, steel, store, office, apartment, Dodd and Prospect Sts. $150,000. Noted June 18.

N. Y., New York—See "Contracts Awarded."

CONTRACTS AWARDED

N. Y., New York—Ella A. Wendell Estate, 175 Bway., 2 story, 20 x 75 ft. store, office, showroom, 533 West St., separate contracts, J. B. Snook, 52 Vesey St., archt. Noted June 18.

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N. Y., New York—Raymond Rubin Co., 10 West Fordham Rd., 4 story store, apartment, separate contracts. $150,000. Goldner & Goldner, 19 West 44th St., archts. Subcontract bids in July or later. Noted June 11.

LOFTS

PROPOSED WORK

N. Y., New York—Alva Realty Corp., 1508 3rd Ave., soon takes bids general contract 5 story, basement, 25 x 100 ft. loft, storage, showroom, 3rd Ave. and 152nd St. $150,000. DeYoung Moscowitz & Rosenberg, 205 East 42nd St., archts.

PUBLIC

PROPOSED WORK

Conn., Noroton—INFIRMARY—State, B. M. Holden, chn. Veterans' Home Comn., 222 Girard St., Darien, plans by Payne & Keefe, 231 State St., New London, infirmary at Veterans' Home. $250,000.

Mass., Wrentham—EMPLOYEES, etc.—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, sketches by J. H. Ritchie & Associates, 250 Stuart St., Boston, 3 story, basement employees building and 1 story heating plant, brick, stone, steel, plain found., at Wrentham State School. $150,000.

Mich., Grand Rapids — ARMORY — Grand Rapids Naval Reserve, 13th Div., I. J. Van Kammen, lieut. com., plans by C. Steketee, Grand Rapids, 1 and 2 story, steel, rein.-con., brick armory, incl. drill hall, rifle and pistol ranges, quarters. $150,000.

N. J., Maplewood—MUNICIPAL—Township Com., Municipal Bldg., 2 story, basement, brick, steel. $275,000. Project in abeyance. Noted June 4.

N. J., Millburn—LIBRARY—Bd. Trustees, D. K. Irwin, chn., Twp. Hall, 2 story, basement, brick, steel. $150,000. **Maturity probably soon.** Architect not selected.

Tex., Fort Worth—POLICE STATION—City, c/o O. E. Carr, plans by Wyatt C. Hedrick, 1st Natl. Bldg., 4 story, basement, brick, rein.-con., stone, cut stone trim, West 13th and Macon Sts. Election June 21, $250,000, for same.

BIDS ASKED

Mass., Worcester — AUDITORIUM — July 7 (extended date), by City, Worcester Memorial Auditorium, brick, stone, steel, Salisbury St. $2,000,000. L. W. Briggs & Co., 314 Main St., archts. F. C. Hirons, 40 East 49th St., New York, engr. Noted June 4.

N. Y., Bedford Hills—REFORMATORY—July 9, by Commissioner Correction, State Office Bldg., Albany, miscellaneous remodeling 4 buildings, at New York State Reformatory for Women.

CONTRACTS AWARDED

Ark., Russellville — COURT HOUSE — Pope Co., c/o J. G. Hill, judge, general contract 4 story, basement, 70 x 112 ft., concrete, brick, stone, to Gordon Walker Co., Rector Bldg., Little Rock, $118,182. This corrects report in May 28 issue, under "Contracts Awarded."

N. J., Elizabeth—COURT HOUSE—Bd. Freeholders Union County, Court House, general concrete 15 story, basement, brick, steel addition, to F. Brisco Co., Inc., 287 South 19th St., Newark, $714,440; plumbing, to Ruehl & Hatfield, 384 South 10th St., Newark, $111,111; heating and ventilating, to F. J. Wohrle, Inc., Tube Concourse Bldg., Jersey City, $97,370; electrical work, to Victor Electric Co., 60 West Grand St., $44,045; elevators, to Otis Elevator Co., 19 Williams St., Newark, $42,222; steel and ornamental iron to Oltmer Iron Wks., Manhattan Ave., Jersey City, $209,295. Grand total $1,218,483. Noted May 28.

N. J., Newark — FIREHOUSE — Bd. City Comrs., City Hall, general contract 3 story, basement, 75 x 75 ft., brick, steel, to Pellecchia Constr. Co., 50 Branford Pl., Newark, $126,000; plumbing, to Jachnig & Peoples, Inc., 221 13th Ave., Newark, $9,196; heating, to F. Farrell, 269 Camden St., Newark, $9,441; electrical work, to Buhl & Caffrey, 35 Hudson St., $8,543. Grand total $153,180. Noted June 4.

UNCLASSIFIED

PROPOSED WORK

Conn., Darien—EXCHANGE—Southern New England Telephone Co., J. F. Moran, pres., 157 Church St., plans by D. Orr, 956 Chapel St., New Haven, 2 story, basement, brick, steel, Sedgewick Ave. $150,000.

Ia., Iowa City — EXCHANGE — Northwestern Bell Telephone Co., 904—9th St., Des Moines, plans by S. J. Temple, Union Bank Bldg., Davenport, 2 story, rein.-con., brick, hollow tile, Bedford stone top addition. $200,000.

Mass., Worcester—LIBRARY, etc.—City, P. H. Duprey, pres. Library Bd., 16 Norwich St., branch library Tatnuck Sect. and branch library and community building, Britain Sq. To exceed $150,000. Architect not selected.

N. J., Elizabeth — HOME — Home for Aged Women, 1073 East Jersey St., 2 story, basement, brick, steel home for aged women, West Jersey St. and De Hart Pl. $150,000. **Maturity probably soon.** Architect not selected.

N. Y., New York — RESTAURANT, etc. — Childs Restaurant, 200 5th Ave., soon lets general contract restaurant, kitchen, storage, 136 William St. $150,000. J. C. Westerveld, 36 West 34th St., archt. Noted June 11.

BIDS ASKED

Mass., Foxboro—HOME for AGED—June 26 by Doolittle Home, C. Conklin, pres., Broadway, Taunton, and Hutchins & French, archts., 11 Beacon St., Boston, altering and constructing 2 story, basement, brick, steel addition, plain found. $150,000. Noted Feb. 5.

CONTRACTS AWARDED

Ill., Joliet—EXCHANGE—Illinois Bell Telephone Co., c/o E. A. Helzer, engr. buildings, 212 West Washington St., Chicago, 3 story, 94 x 111 ft., rein.-con., brick, steel, plain found., Ottawa Rd. and Benton St., to Kaiser-Ducett Co., Joliet. Est. $400,000.

Neb., Omaha — ORPHANAGE — St. James Roman Catholic Church, 808 North 36th St., general contract concrete, brick, hollow tile orphanage group, to A. H. Brodkey Co., Saunders-Kennedy Bldg., $205,000; heating, plumbing, ventilating, to Lynch Bros., 505 South 13th St., $40,000; electrical wiring, to Sterling Electric Co., 2429 Farnam St., $6,500. Grand total $251,500.

N. Y., Irvington—HOME—Irvington House for Cardiac Children, 244 Madison Ave., New York, general contract 3 story, 200 x 200 ft., brick, steel, to J. Lowry, Inc., 270 Madison Ave., New York, N. Y. Est. $500,000.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Del., Wilmington—CHEMICAL PLANT—Ethyl Gasoline Corp., 135 East 42nd St., and Dow Chemical Co., 60 East 42nd St., both New York, plant for extraction of bromides from sea water. To exceed $5,000,000.

Ky., Louisville—PACKING PLANT — Henry Fisher Packing Co., 1862 Melwood Ave., 4 story, basement, 70 x 90 ft., rein.-con. steel, brick addition, 1860 Melwood Ave. $75,000.

Ky., Owensboro—OIL REFINERY—Company being organized, by W. W. Tapp, Jr., Starks Bldg., Louisville, sketches oil refinery, 20,000 bbl. crude oil capacity per day, Old Sheehan Flying field. $110,000.

Mass., Everett—PLANT—Merrimack Chemical Co., Chemical Lane, soon lets contract 1 story brick, steel alum process building plant unit, concrete found., Chemical Lane. $40,000. Private plans.

Mass., Hyde Park—FACTORY—Royal Curtain Mfg. Co., 35 Kingston St., Boston, receiving preliminary estimates, altering 2 story, timber, Hyde Park Ave. $40,000. Private plans.

Mich., St. Clair—AIRPLANE FACTORY—Buhl Aircraft Co., Marysville, 1 and 2 story, brick, steel, rein.-con., plain found., St. Clair Airport. $100,000. Private plans.

N. H., Berlin—PLANT—Coos Gas Co., C. J. Coulombe, pres., gas manufacturing plant. $40,000. Architect not selected.

N. J., Allwood—PLANT—Amer. Colortype Co., 207 West 25th St., New York, will award general contract in July altering 2 story, basement plant, $40,000. Bids in. Ballinger Co., 12th and Chestnut Sts., Phila., Pa., archt. Road work awarded to M. H. and F. E. Lyman, Inc., 119 Midland Ave., Glen Ridge. Noted May 7.

N. J., East Rutherford — FACTORY — East Rutherford Syringe Co., 75 Mozart St., 2 story, basement, 30 x 70 ft., brick, steel, 54 Mozart St. $40,000. **Maturity probably in September.** J. T. Camlet, 26 Piaget Ave., Clifton, archt. Noted June 11.

N. J., Hoboken—FACTORY—Garsten Realties Co., J. Bomano, pres., 1827 Bergen Turnpike, bids in September on revised plans 1 story, basement, brick, steel, Madison and Jefferson Sts., between 14th and 15th Sts. $40,000. Private plans. Noted May 21.

N. J., Jersey City—BAKERY and STORE—F. Schreiber, c/o G. W. Backoff, archt., 1023 Broad St., Newark, will not build 1 story, basement, brick, steel bakery and store alterations, 872 Newark Ave. $40,000. Project abandoned. Noted May 21.

N. J., Newark — LAUNDRY — New Jersey Toilet & Towel Supply, 69 New St., soon lets contract altering laundry, power plant and purchasing equipment, machinery, 42 Clifton St. $180,000.

N. J., Roselle—DRESS FACTORY—Roselle Frocks, Inc., 1107 Chancellor Ave., 2 story, basement, 80 x 100 ft., brick, steel, Chancellor Ave. $40,000. Bids in. Project in abeyance. J. Anderson, 251 North Broad St., Elizabeth, archt. Noted June 4.

N. Y., Bolivar—OIL REFINERY—Allegany Refining Co., Inc., oil refinery. $200,000. H. Ross, Warren, Pa., engr. Noted June 11.

N. Y., Buffalo—INDUSTRIAL—A. F. Oliver Gear & Machine Co., Inc., 60 Cherry St., plans by Green & Son and Hopkins, 1 Niagara Sq., and bids about June 24, 1 story, 85 x 250 ft., brick, steel, Niagara near Albany Sts.

N. Y., Eastview—LAUNDRY—Bd. Supervs. Westchester Co., F. L. Merritt, clk., White Plains, soon lets contract laundry building at Grasslands Hospital, $150,000. Walker & Gillette, 599 Madison Ave., New York, archts.

N. Y., New York—FACTORY—Kohler & Campbell, 601 West 50th St., plans by Ross & McNeil, 274 Madison Ave., altering 6 story,

Factories and Mills (Continued)

100 x 125 ft. factory, incl. elevators, elevator shafts, 627 West 50th St.

N. Y., New York—MANUFACTURING—O. G. Villard, 14 Barclay St., plans by A. J. Barzaghi, 13 East 37th St., altering 5 story manufacturing and storage building, incl. elevators, elevator shaft, plumbing, heating, electrical work, 14 Barclay St. $40,000.

N. C., High Point—FINISHING PLANT, etc. —Adams Millis Corp., finishing plant and additions to hosiery mills, Pine St. To exceed $150,000.

Pa., Erie—INDUSTRIAL and OFFICE—General Electric Co., O. D. Young, pres., Schenectady, N. Y., sketches 2 story, 40 x 70 ft., brick, steel, concrete found., East Lake Rd. $40,000. A. Dalton, chf. engr. and A. Vogel, assistant ch. engr., c/o owner.

Tex., Brownsville — FACTORY — Chas. M. Haskell, Oklahoma City, Okla., sketches rein.-con., face and common brick factory to produce carrot syrup, rein.-con. found.

Tex., Mineola—OIL REFINERY—Dean Lewis & Associates, Mineola and Dallas, soon takes bids oil refinery plant. $125,000.

N. S., Halifax—FACTORY—Christy, Brown Biscuit Co. Ltd., 1 story, timber, plain found. $40,000. E. J. MacDonald, 250 Stuart St., Boston, Mass., engr.

Ont., Toronto—FACTORY—Mack Truck of Canada Ltd., 1933 Younge St., truck manufacturing plant. $100,000.

BIDS ASKED

Conn., Middlefield—COLD STORAGE PLANT —Lyman Farms, J. Lyman, taking bids 1 story, 65 x 165 ft., brick, steel, cold storage plant for fruit, cork insulation, Lyman Farm. To exceed $40,000. L. J. Thompson, 521 Corbin Ave., New Britain, archt. Noted June 18.

Conn., Niantic—LAUNDRY, etc.—June 30, by Bd. Directors Connecticut State Farm for Women, c/o State Comptroller, State House, Hartford, laundry and canning building, storage building, root cellar and sun porch additions, $150,000. Golden Storrs & Co., 11 Asylum St., Hartford, archts.

Conn., Southington—COLD STORAGE FRUIT PLANT—Lake View Farm, H. Rogers, mgr., taking bids 1 story, 68 x 95 ft., brick, steel, cork insulation, $40,000. L. J. Thompson, 521 Corbin Ave., New Britain, archt. Noted June 18.

La., New Orleans—ICE PLANT—June 30, by F. W. Mathews, secy. Charity Hospital, ice manufacturing plant, equipment, refrigerating plant, incl. vertical single acting double cylinder ammonia compressor, double ammonia receiver, freezing tank, $25,000.

Mass., Boston — PRINTING PLANT — City Printing Dpt., taking bids 3 story, basement, brick, stone, steel, plain found., North and Richmond Sts. $300,000. J. M. Gray & J. P. Heffernan, 175 High St., archts. Noted May 7.

N. J., Passaic—DYE WORKS—See "Contracts Awarded."

N. Y., Brooklyn—FACTORY—Thames Trading Co., 47 Thames St., taking bids on separate contracts factory, Bogart St. and Harrison Pl. $250,000. S. Goldsmith, 4914 Church St., archt. Noted June 18.

CONTRACTS AWARDED

Conn., Greenwich — ELECTROTYPE PLANT —Conde Nast Pub. Co., Post Rd., 1 story, 60 x 140 ft., concrete, to Moncelli Mezzullo, 132 Pearl St., Port Chester, N. Y. Noted June 11.

Ind., Anderson—FACTORY—Guide Lamp Co., 2 story, basement, 40 x 100 ft., brick, steel, $40,000. Owner builds. Private plans. Noted May 1, 1930.

Ind., Culver—LAUNDRY PLANT—Military Academy, general contract 60 x 100 ft., rein.-con., brick, steel, to L. J. Street, 3764 Park Ave., Indianapolis. Est. $40,000.

Mass., Jamaica Plain (sta. Boston) — LAUNDRY — R. A. Skoagland, 34 Elm St., 1 story, irregular sized, concrete, steel, concrete found., to J. R. McPherson, 25 Burr St. Est. $40,000. Noted July 17.

Mass., West Chelmsford—GRANITE CUTTING PLANT—H. E. Fletcher Co., 1 story, 75 x 120 ft., steel plant, incl. 200 ft. craneway, power lines, air lines and dust collector system, to Leo F. Caproni & Co., 1044 Chapel St., New Haven, Conn. Est. $100,000.

N. J., Allwood — PLANT — See "Proposed Work."

N. J., Newark—WOODWORKING FACTORY —J. C. Kohaut, Inc., 117 Green St., general contract 3 story, basement, 50 x 100 ft., brick, steel, to Pellecchia Constr. Co., 50 Branford Pl. Est. $40,000. Noted June 11.

N. J., Passaic—DYE WORKS—Passaic Piece Dye Wks., 420 Bloomfield Ave., 2 story, basement, 70 x 150 ft., brick, steel addition, Bloomfield Ave., separate contracts. $40,000. J. F. Kelly, Post Office Bldg., archt. Noted June 4.

N. Y., New York—MILK DISTRIBUTION— Cadjolis Corp., 704 East 133rd St., milk distribution building, 133rd St. and Willow Ave., to A. C. Chesley Co., 704 East 133rd St. Est. $40,000.

N. Y., New York—FACTORY—Hannah C. Young, 37 Murray St., altering light manufacturing and workrooms, to Wald & Ginsburg, 611 Bedford Pl., Brooklyn. Est. $40,000.

Tex., Eagle Lake—ICE PLANT, etc.—Central Power & Light Co., Alamo Bank Bldg., San Antonio, constructing large ice storage vault additions, alterations to ice and power plants, some new ice equipment, new unit for light plant, some line extensions, etc. to E. H. Reese, Eagle Lake. Est. $40,000. Noted Mar. 5.

W. Va., Chester—FACTORY, etc.—Harker Pottery Co., East Liverpool, O., general contract 1 story, basement, 140 x 200 ft., brick, concrete factory, also razing old type kilns on site, to Finley Bros. Lumber Co., Chester, $50,000; tunnel kilns, 200 ft. long, for firing bisque and glost ware, to Harrop Ceramic Serv. Co., 310 West Broad St., Columbus, O., $100,000. Bids later for tunnel kiln for decorated ware. Noted May 14.

GARAGES

PROPOSED WORK

Indiana—National Autohaven Co., 201 North Wells St., Chicago, Ill., will not build service stations in various cities. Company under investigation. Noted June 19.

N. Y., Brooklyn—M. Tucker, 120 Magnolia Ave., Floral Park, 90 x 150 ft. service garage, Crystal St. and Liberty Ave., $40,000. **Maturity soon.** M. Hirsch, 350 Stone Ave., archt. Noted June 18.

N. Y., New York—Rockwells Bakery, 328 East 75th St., plans by W. Shary, 22 East 17th St., altering 100 x 125 ft. factory into service garage, 439 East 75th St. $40,000.

N. Y., New York—W. Tatt, 348 West 27th St., plans by W. Shary, 22 East 17th St., 34 story service garage, 348 West 27th St. $100,000.

N. Y., New York — Two Thousand One Hundred Five Daly Avenue Corp., M. Savio, pres., 1708 Lexington Ave., 2 story, basement service garage, River Ave. and McClellan St. $100,000. **Maturity about January.** A. Lombardi, 1221 Sheridan Ave., archt. Noted June 11.

N. Y., New York—Two Hundred Twenty West 61st Street Corp., L. Irish, pres., 60 West 42nd St., 1 story, 100 x 250 ft. service garage, 218 West 61st St. $70,000. **Maturity in November or later.** Noted June 11.

N. Y., New York—W. W. Westervelt, 194 Godwin Ave., Ridgewood, N. J., general contract altering and constructing 3 story, 100 x 125 ft. garage addition, 252 West 87th St. $45,000. Maturity about November. LeR. P. Ward, 205 East 42nd St., archt. Noted June 11.

N. Y., West New Brighton—Tompkins Bus Corp., M. Gordon, in charge, 735 Richmond Rd., St. George, sketches 2 story, basement, brick, steel garage, Castleton Ave. $150,000.

O., Toledo — D. Yoder, pres. Port Toledo, Inc., Toledo, plans by Mills, Rhines, Bellman, Nordhoff, Ohio Bank Bldg., 7 story, basement, 60 x 180 ft., rein.-con., steel modern parking garage, 300 car capacity, designed for landing of planes of autogiro type, Madison at Summit St. $500,000.

R. I., Gloucester—State, Dpt. State Police, New Industrial Trust Bldg., Providence, 1 and 2 story garage and state police barracks, $50,000. Architect not selected.

BIDS ASKED

N. H., Milford—June 27, by Souhegan Motor Co., c/o A. W. Osberg, archt., 795 Elm St., Manchester, 2 story, 50 x 105 ft., brick public garage, concrete found. $40,000. Noted Apr. 9.

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., New York—N. Libardo, 78 Woodycrest Ave., White Plains, taking bids on separate contracts 1 story, 100 x 107 ft. service garage, Van Nest Ave. and 178th St. $40,000. M. W. Del Gaudio, 545 5th Ave., archt. Noted June 11.

R. I., Richmond — State, Dpt. State Police, New Industrial Trust Bldg., Providence, taking bids 1 and 2 story, brick garage and state police barracks, $50,000 or more. Jackson, Robertson & Adams, 1216 Turks Head Bldg., Providence, archts. Noted May 21.

CONTRACTS AWARDED

Conn., West Hartford (br. Hartford)—Smith & Jessen, 68 Park Rd., 1 story, basement, 35 x 108 ft. and 35 x 55 ft., brick garage, bakery, store, Park Rd., to L. Schoolnik, 44 Hebron St., Hartford. Est. $40,000. Noted May 21.

Mo., Sikeston—Missouri Hy. Comm., Jefferson City, concrete, brick garage and division office, to J. Eppleton, Columbia. $62,500. Noted June 11.

N. J., East Orange—W. Gudzenhauser, c/o N. Harris, archt., 17 Mechanic St., Newark, 1 story, basement, 100 x 110 ft., brick, steel, rein.-con., garage, Spring St., to State Builders, Inc., 810 Broad St., Newark. Est. $150,000.

N. Y., Brooklyn—P. S. Glickman, 1498 Bway., will build 100 x 200 ft. service garage, separate contracts. $40,000. H. J. Nurick, 44 Court St., archt. Noted June 18.

SHOPS AND FOUNDRIES

BIDS ASKED

Wash., Seattle—SHOP, etc.—July 7, by S. K. Humes, dir. Hys., Olympia, 66 x 137 ft. maintenance shop and building and 31 x 71 ft. rein.-con. office building, 6th Ave. S. and Spokane St.

See proposal advertising on page 83

POWER PLANTS

PROPOSED WORK

N. J., Newark—Pub. Serv. Electric & Gas Co., Terminal Bldg., 2 story, basement, 40 x 110 ft., brick, steel electric substation, Springfield Ave. $115,000. Private plans.

S. D., Aberdeen—State, J. Berg, state engr., Pierre, plans by G. F. Fossum, Aberdeen, 2 story, 40 x 70 ft., rein.-con., brick central heating plant at Northern State Normal and Industrial School. $100,000. C. Foster, 512 Sellwood Bldg., Duluth, Minn., engr.

BIDS ASKED

Minn., Moorhead—See "Schools."

N. Y., Geneva — July 14, by Commissioner Education, Educ. Bldg., Albany, boilers, service connections (tunnels), repairing, replacing, heating, for Chemical Building at New York State Agricultural Experiment Station.

N. Y., New York—June 25, by Dpt. Hospitals, Municipal Bldg., converting two 250 hp. Heine water tube boilers for pulverized fuel firing in the boiler room Lincoln Hospital.

S. D., Brookings—July 7, by State College, C. W. Pugsley, pres., general contract power plant addition, furnishing, installing 450 hp. power boiler, smoke breeching, stoker, draft fans. F. C. W. Kuehn, Huron, archt.

CONTRACTS AWARDED

Conn., Bristol—Connecticut Light & Power Co., W. W. Foreman, engr. in charge, Leavenworth St., Waterbury, steel and outside work for steam regenerating plant, Leavenworth St., to G. Lacourse, 57 George St. Est. $175,000. Noted May 7 under "Contracts Awarded."

Mo., Macon—Bd. P. Wks., turbo-generator, to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., $222,995; boiler and superheater, to Union Iron Wks., Erie, Pa., $10,749. Coxe stoker, to Combustion Eng. Corp., 200 Madison Ave., New York, $5,504; condenser, to Elliott Co., 305 Varbes St., Pittsburgh, Pa., $5,100; feed water heater, to Cochrane Corp., Allegany Ave., Phila., Pa., $1,050; boiler feed pumps, to Goulds Pumps, Inc., Seneca Falls, N. Y., $1,300; cooling tower, to Lilie-Hoffman Cooling Towers, Inc., 4948 Rebec Pl., St. Louis, $2,900. Grand total $49,598. Noted June 4.

O., Martins Ferry—Turbine and generator, to Westinghouse Electric & Mfg. Co., Grant Bldg., Pittsburgh, Pa., $53,600.

WAREHOUSES

PROPOSED WORK

Conn., Greenwich—Doran Bros., 29 Railroad Ave., took bids on June 15, and will award contract in July, 2 story, 52 x 154 ft., brick, concrete storage warehouse, Railroad Ave. $55,000. G. S. Kingsley, 103 East 125th St., New York, archt. Noted Mar. 5.

N. Y., New York—One Hundred Eleven West End Corp. and New York Central R.R. Co., c/o J. A. Delehanty, 115 Bway., will award general contract about July 15, warehouse, West End Ave., from 64th to 65th Sts. $1,500,000. Bids in, DePace & Juster, 151 West 46th St., archts. Noted Nov. 6.

N. Y., New York—L. Rothman, 125 West 45th St., soon takes bids general and separate contracts 100 x 100 ft. paper storage warehouse, Randall Ave. and Manida St., for J. H. Hertz, 236 West 70th St. To exceed $40,000. Noted June 11.

N. Y., New York—E. F. Sibbert, archt., 114 5th Ave., New York, bids after June 30, 7 story stockroom, storage, Morris Ave. and 164th St., for S. H. Kress Co., Jessee, 114 5th Ave. W. E. Diller Constr. Co., 912 Grand Concourse, owner. Noted June 11.

N. Y., New York — Stumpp & Walter, 30 Barclay St., plans by Starrett & Van Vleck, 393 7th Ave., storage and warehouse, 37 Warren St. $175,000.

Pa., Erie—General Electric Co., D. F. Smith, Gen. Supt., East Lake Rd., will soon award contract for a 1 story warehouse. Private plans.

Que., Montreal—T. Belhumeur, 4237 Bordeaux St., 27 x 54 ft., brick, steel warehouse, $112,000.

BIDS ASKED

N. Y., Brooklyn—H. M. Hillman, Flatbush and Myrtle Aves., bids about June 20, altering 3 story storage building, $40,000. Elling Owre, 53 Fort Hill Circle, St. George, archt. Noted June 4.

CONTRACTS AWARDED

Mass., Cambridge — Whitehead Metal Products Co., 69 Washington St., Boston, 4 story, 120 x 140 ft., brick, concrete warehouse, Northern Artery, to George A. Fuller Co., 11 Beacon St., Boston. Est. $200,000.

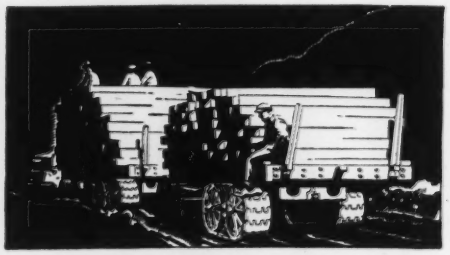
Tex., Galveston — Cotton Concentration Co., Commerce Bldg., 3 story, 330 x 360 ft., rein.-con. storage sections, to Johnson Bros., Galveston, $75,000. Noted June 18.

B. C., Vancouver — Vancouver Ice & Cold Storage Co., Ltd., 11 Gove Ave., 3 story, 45 x 76 ft., rein.-con. addition to cold storage warehouse, plain found., to Smith Bros. & Wilson Ltd., 1267 Richard St., $45,000.

Constr. News page 285

For the quick, easy hauling of heavy loads...

■ There are innumerable uses for the ATHEY TRUSS WHEEL Stake Platform Wagon. With stake sides removed, railroad ties, boxed and unpacked supplies can be easily handled. It is also used as chassis for compressor units, electric power plants, rotary draw works, slush pumps, tanks, hoists and other equipment. The platform may be removed and standard bunks employed for handling pipe, logs, tanks or other long loads. . . . In addition, there are the economies of ATHEYS' extraordinary light-running qualities — the surety of having equipment delivered on time—the certainty that bad roads cannot mire important supplies — the economies that come from hauling twice the load with half the tractive power. Write for information.

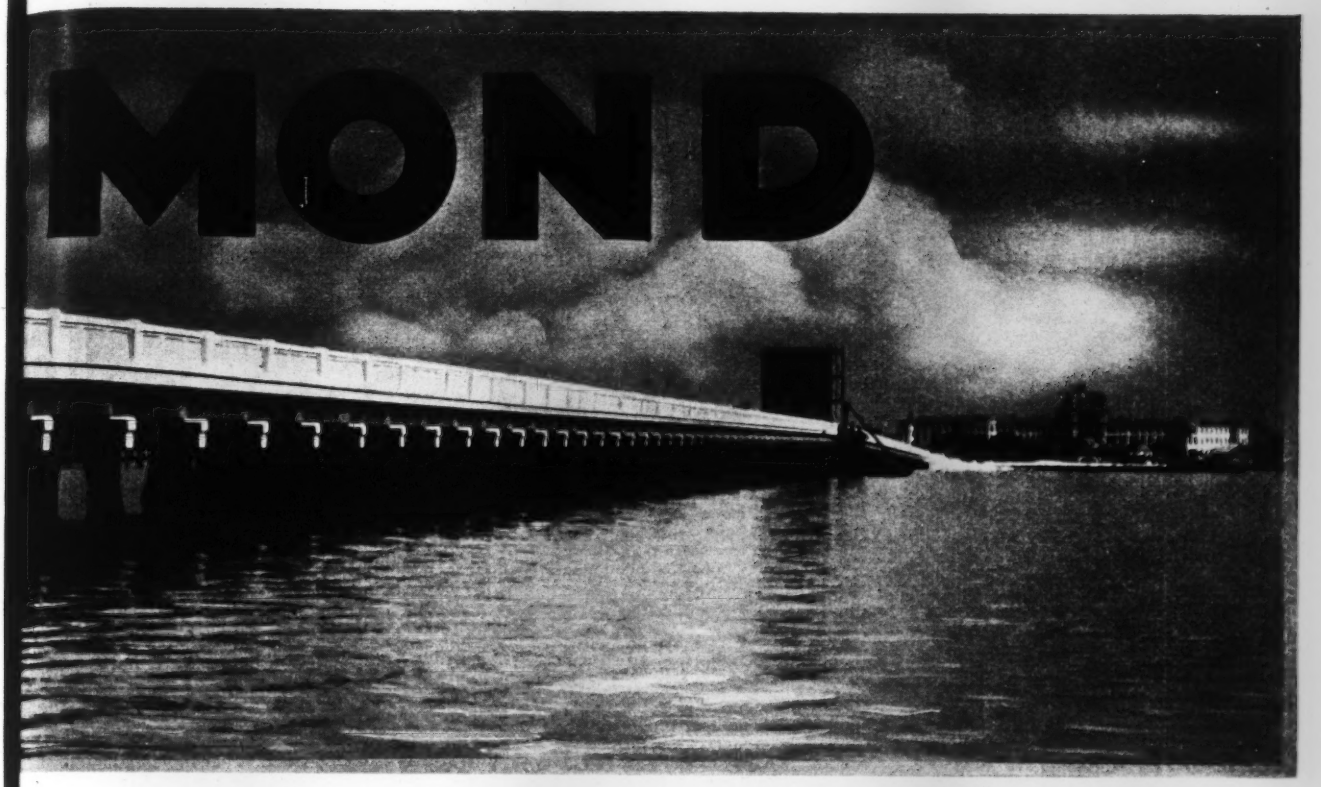


ATHEYS are available in more than 100 units... An ATHEY for every job.

ATHEY

TRUSS WHEEL CO.
130 North Wells St.
CHICAGO, U. S. A.

Cable Address: "Trusswheel," Chicago



Barron G. Collier Bridge

PEACE RIVER
PUNTA GORDA
FLORIDA

This notable structure, officially designated as Project No. 70, Road 5, was built for the Florida State Highway Department.

With an overall length of 4,375 feet, it embodies 756 24" square precast concrete piles, 65 to 75 feet long.... 9,828 yds. of concrete in Caps, Deck and Sidewalk....1,674 yds. more in the Bascule Piers.

Four straight and two batter piles for each pier were driven at the same time. Caps and deck were precast and placed in position as units.

To such work—as indeed to all types of unusual concrete construction—Raymond brings a heritage of experience, together with personnel and equipment adequate to complete any job, invariably well within schedule, with maximum economy....anywhere....

Whether it be a great concrete bridge or merely the driving of a few cast-in-place concrete piles on the smallest foundation contract.

RAYMOND CONCRETE PILE COMPANY

ATLANTA, GA.
BALTIMORE, MD.
BOSTON, MASS.
CHICAGO, ILL.
CLEVELAND, O.
DETROIT, MICH.
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MILWAUKEE, WIS.
PHILADELPHIA, PA.
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140 CEDAR STREET
NEW YORK
"A FORM FOR EVERY PILE
A PILE FOR EVERY PURPOSE"

SAN FRANCISCO, CAL.
SEATTLE, WASH.
ST. LOUIS, MO.
ST. PAUL, MINN.
WASHINGTON, D. C.
BOGOTA, COLOMBIA
BUENAVENTURA, COLOMBIA
CARACAS, VENEZUELA
HONG KONG, CHINA
LONDON, ENGLAND
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PANAMA, C. Z.

And in Canada—RAYMOND CONCRETE PILE COMPANY LTD., Montreal, Canada

A Sensible ROPE BUYING BASIS

In the last analysis it is performance that counts in wire rope. Rope buyers may *order* so many feet of wire rope—but what they really purchase is a certain degree of rope safety; so many hours of rope service. ¶ To furnish rope where performance with safety is the paramount requisite is an opportunity always welcomed by Roebling. There can be only one result of Roebling's exacting standards and painstaking methods of manufacture—a wire rope of unsurpassed safety, durability and economy.

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, N. J.

Branches in Principal Cities — *Export Dept., New York, N. Y.*

ROEBLING "BLUE CENTER" STEEL **WIRE ROPE**

Wire · Wire Rope · Copper & Insulated Wires & Cables

Welding Wire · Flat Wire · Wire Cloth & Wire Netting

BIG in SIZE and Capacity at a Popular Price

THE NEW HAISS "50" brings you the advantages of Haiss design and building in a *1½—1¾ cu. yd. per minute machine*—at an attractive price. Big Value! 37 H.P. Waukesha Motor—Enclosed ball and roller bearing Transmission—Haiss Feeding Propellers—12"x18" Buckets—Balanced Elevator—13,600 lbs. of husky machine . . . **Investigate!**

$3650 F. O. B. New York (WITH STRAIGHT CHUTE)

HAISS "50" LOADERS

GEORGE HAISS MANUFACTURING CO., INC.
140th St. and Rider Ave., New York, N. Y.

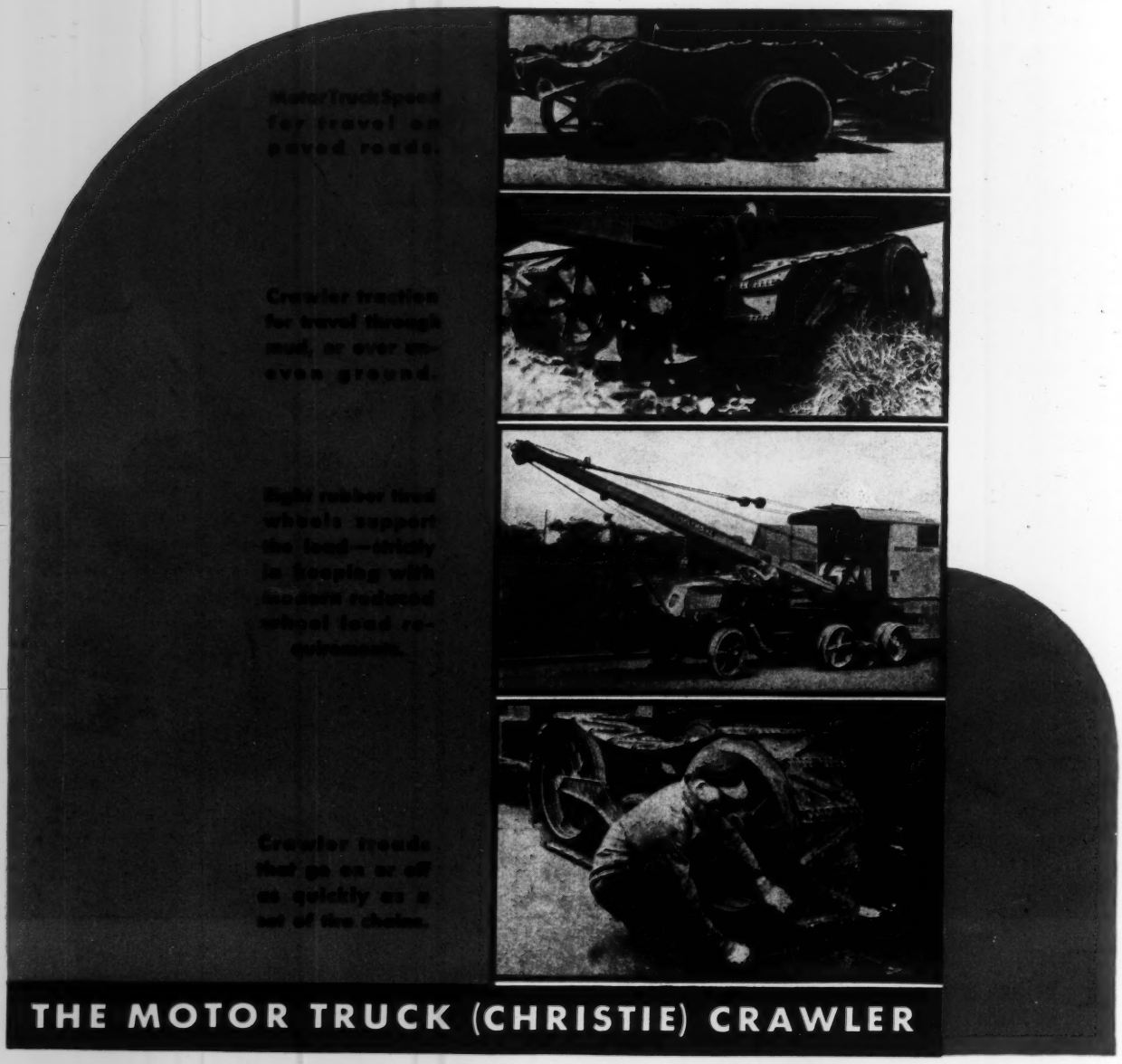
☐ Please send me a copy of your Catalog No. 731—with particular reference to a HAISS "50" LOADER

for handling.....

Name.....

Address.....

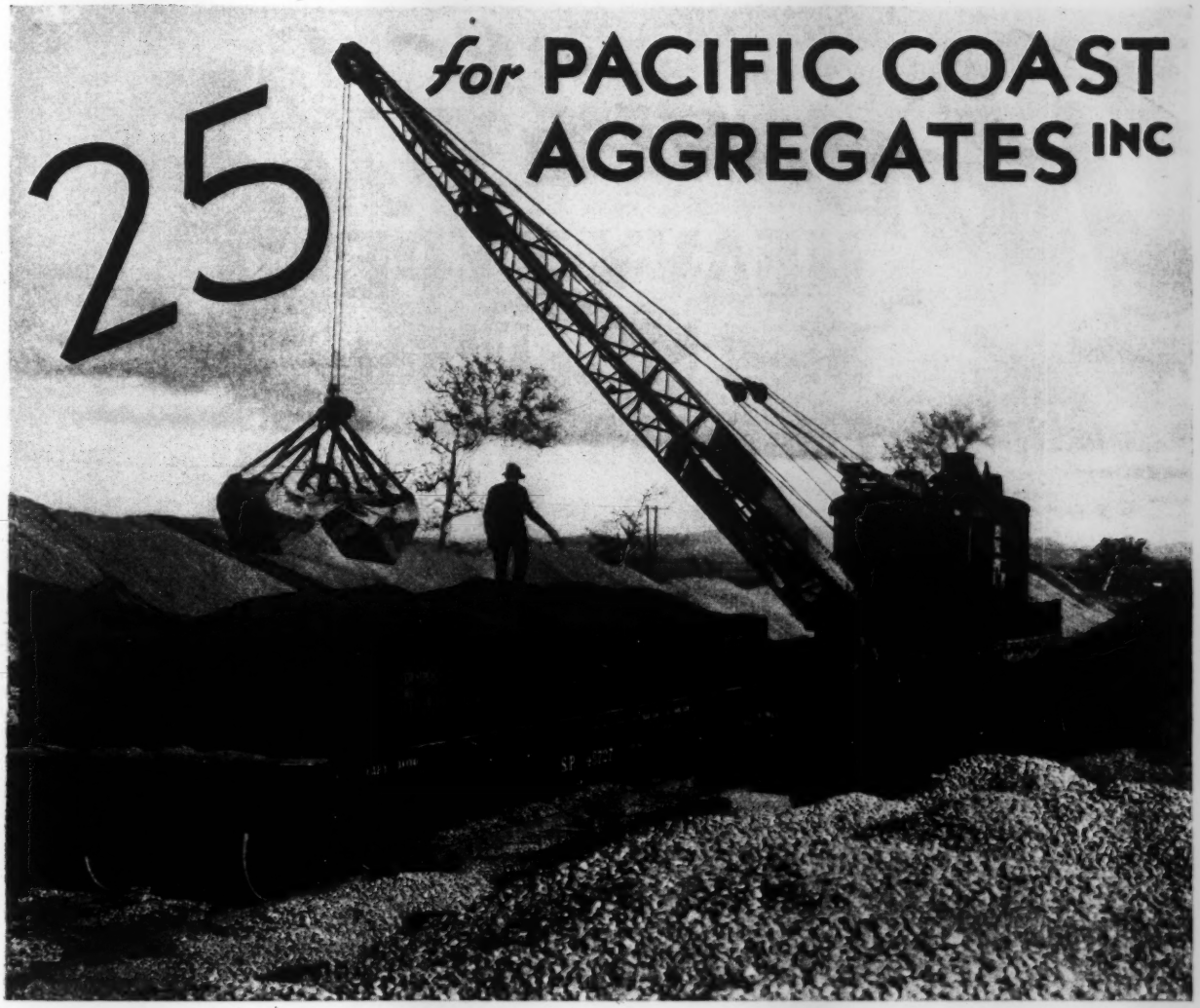
Also: THE HAISS "EXCAVATOR"—PORTABLE BELT CONVEYORS—CLAMSHELL BUCKETS


Motor truck speed for travel on paved roads.
Crawler traction for travel through mud, or over uneven ground.
Eight rubber tired wheels support the load—strictly in keeping with modern reduced wheel load requirements.
Crawler treads that go on or off as quickly as a set of tire chains.
THE MOTOR TRUCK (CHRISTIE) CRAWLER

Equipped with "Christie Crawlers," Universals can travel to crane jobs anywhere. Christie Crawlers for truck cranes are applied exclusively on Universals.

THE UNIVERSAL CRANE COMPANY
LORAIN, OHIO

UNIVERSAL



East, west, north or south—in all parts of the country, Industrial Brownhoist cranes are the choice of the large companies. For example, Pacific Coast Aggregates, Inc., one of the west's biggest sand and gravel producers, has purchased twenty-five.

Why are Industrial Brownhoists preferred by successful concerns—why do they invariably buy one after another? Simply because these companies weigh values carefully and know that Industrial Brownhoist locomotive and crawler cranes handle materials at the lowest cost.

A good locomotive or crawler crane will show the same savings on your work as it does for thousands of others and will handle all kinds of materials. Our nearby representative can tell you in a few minutes how you can profitably use an Industrial Brownhoist. Why not call him in?

Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco, Cleveland.

INDUSTRIAL BROWNHOIST

Ransome 135 ft.

HEAVY TYPE
Steel Mast Plant
Speeding up a Cincinnati School Job

THE Ransome Heavy Type Steel Mast can be used with any of the three most commonly used concrete chuting plants (Counter-weight Boom Chute Plant, Continuous Line Plant and the Bin Plant) or in a combination of two or more of them. The mast sections are 22½ feet long and of channel and angle construction. Easy to handle —unusually strong. Method of erecting is safe, easy, fast, economical. Light weight, unit type construction, Ransome Chutes offer many advantages in erection and operation of plant. A sliding frame permitting quick change of elevation of the chutes or bin, is standard equipment on all plants.

For complete story of this labor and time saving plant, send for Bulletin 304

W. H. Dunkin & Sons, Contractors are using this plant in pouring concrete for the Oyer School, Cincinnati, Ohio.

Ransome Concrete Machinery Company

1850—Service for 81 Yeays—1931

Dunellen **New Jersey**

MILLION-DOLLAR CONCERNS HAVE TESTED THESE TRUCKS FOR YOU

Million-dollar concerns in the Contracting Industry and in all leading industries . . . the country over . . . have proved the merit of Dodge Trucks for you. Million-dollar concerns with hauling work similar to your own, and with a desire—identical with your own—for low cost, dependability and able performance. Million-dollar concerns who continue year after year to increase their already large fleets of dependable Dodge Trucks. » » Your Dodge Brothers dealer will gladly show you the impressive list of nationally-known concerns who have put their faith and their dollars in Dodge Trucks. He will also gladly place a Dodge Truck at your disposal for inspection, test and comparison. You will find its price exceptionally low. You will find that balanced design and precision manufacture insure typical Dodge dependability, long life and economy.

THE COMPLETE LINE OF DODGE TRUCKS RANGES IN PAYLOAD CAPACITIES FROM 1,200 TO 11,175 POUNDS—PRICED, CHASSIS F. O. B. DETROIT, FROM $435 TO $2695, INCLUDING THE 1½-TON CHASSIS AT . . . $595

TO HELP LOWER YOUR HAULING COSTS OPERATING RECORD BOOK FREE

DODGE BROTHERS CORPORATION B-7
Detroit, Michigan
Send your Operating Record Book. I understand there is no obligation.

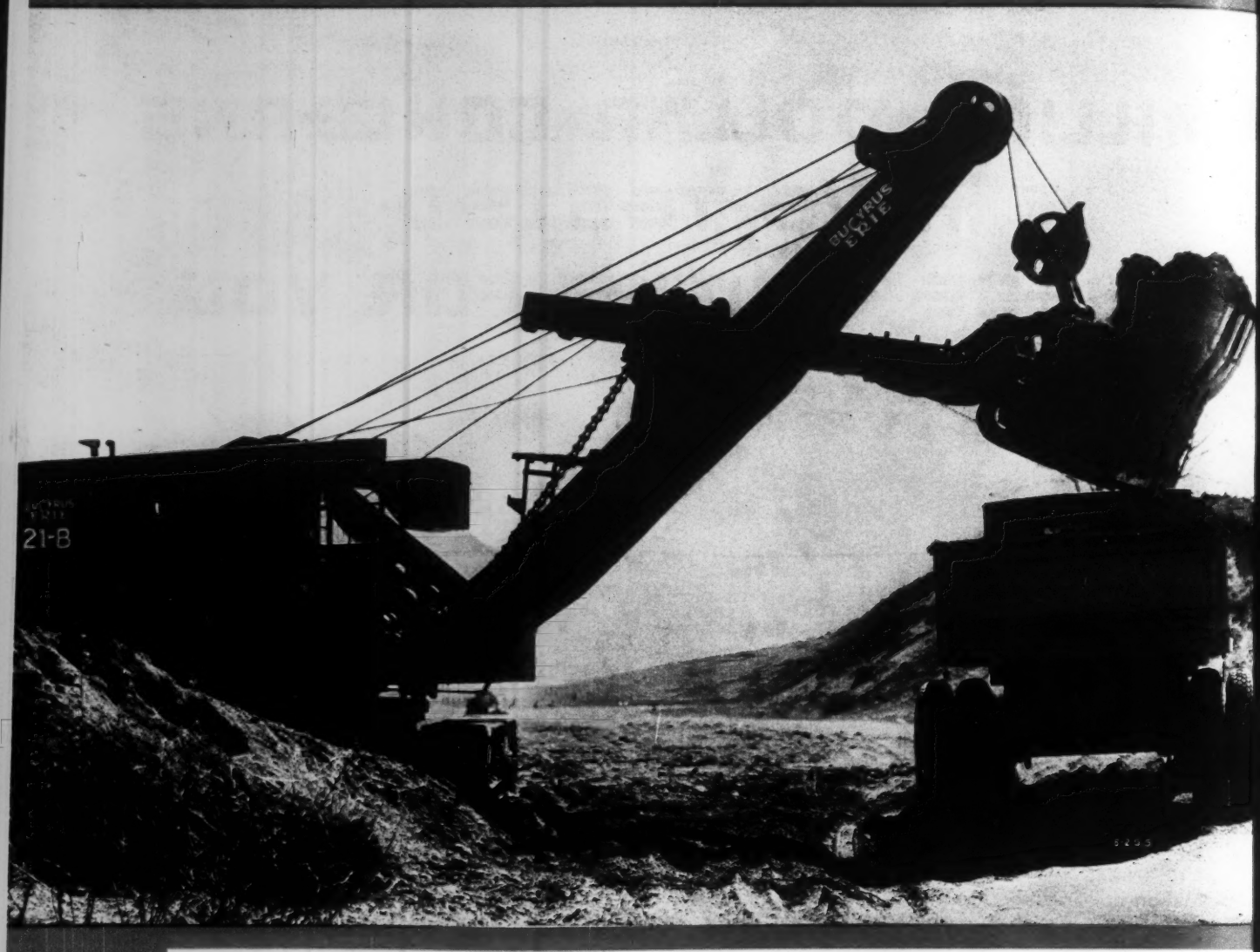
NAME_____

ADDRESS_____

CITY_____ STATE_____

Number of Trucks Operated *(Book for each will be sent)*_____

DEPENDABLE DODGE TRUCKS



Only Bucyrus-Erie offers *all* these features!

The Three Essentials: The best combination of speed, power and stability yet obtained in a 3/4-yard shovel.

Power Choice: A sturdy gas engine — a time tried Diesel — or a dependable electric motor.

These Control Features: Oversize clutches and brakes. Hoist clutches power set. All operating levers toggle in. Double-operating chocking brakes, applied from operator's stand. Swing brake for operating on grade. Direction of motion of operating levers can be easily changed to suit operator.

Gets over the Ground: Steered from operator's stand with cab in any position. Propelling brake also controlled from stand. A friction brake locks the swing during propelling.

3-Side Vision: Operator saves time because he sees what he is doing.

A Quick Look at the Machinery: Bucyrus-Erie ruggedness—a factor of safety against breakdowns and repair costs. Unit steel construction. Accessibility. Easy convertibility. Ball bearings for all continuously running shafts. Fully enclosed transmission, running in oil.

Reversing bevel gears for swinging and propelling completely enclosed and running in oil; ball bearing mounted in one casting to keep gears permanently aligned.

Only two bearings to a shaft; no binding of bearings. Boom-hoist worm and gear completely enclosed and running in oil. Single shaft drive caterpillar mounting. Box-girder boom, light but strong. Famous inserted-tooth dipper.

Silent transmission gears with Maag teeth machine-cut from solid steel. Either rope or chain crowd on shovel. Outside band power-take-off clutch. Positive power dipper trip.

Special extra long and wide mountings for soft ground dragline work.

a fast, new 3/4-yard Bucyrus-Erie

21-B

Convertible Shovel, Dragline, Clamshell, Crane

. . . Another addition to Bucyrus-Erie's new line of universal machines

Greater profits for every contractor who needs a 3/4-yard excavator.

The 21-B is completely new. Yet every detail is tested for its ability to increase speed and economy. No other small excavator has so many features that cut operating costs.

It is to your direct interest to read the accompanying details carefully. But there is no substitute for a point-by-point check of the specifications or the machine itself.

See it perform! Phone or write the nearest branch office.

A-322

BUCYRUS ERIE

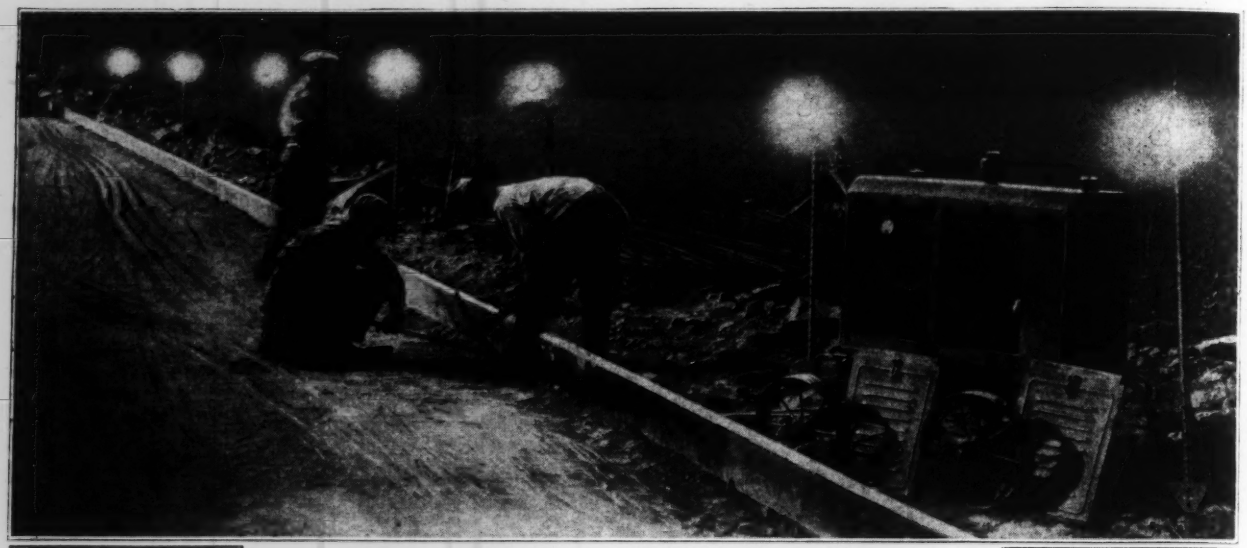
BUCYRUS-ERIE COMPANY, South Milwaukee, Wisconsin

Representatives throughout the U. S. A. *Branch Offices*: Boston, New York, Philadelphia, Atlanta, Birmingham, Pittsburgh, Buffalo, Detroit, Chicago, St. Louis, Kansas City, Mo., Dallas, San Francisco. Offices and distributors throughout the world.

1/2-yard
5/8
3/4
7/8
1
1-1/4
1-1/2
1-3/4
2
2-1/4
2-1/2
3
3-1/2
4
4-1/2
5 and up to 16 yards

Shovels
Draglines
Clamshells
Lifting Cranes
Dragshovels
Magnet Cranes
Tunnel Shovels
Dredges
Dragline Buckets

Gasoline
Diesel
Gas + Air
Electric
Steam
Diesel-Electric



LICKING NIGHT

for the Subgrade Crew at Only 5c per HOUR

The photograph above shows how THE HOLMES CONSTRUCTION CO. uses a single cylinder, 2 KW Novo Flud-Lite Lighting Unit to furnish light for doing all the subgrading on a nine-mile stretch of paving.

Aside from a small charge for depreciation and the short time required to set up and move the outfit, costs for lighting the job were at the ridiculously low rate of less than 5c per hour. The men worked as efficiently as during the day. And the paver was permitted to work continuously at top speed.

This is but one example of the way contractors are licking night on all kinds of construction jobs to speed up the work and increase their profits. Get complete details by writing for the special folder.

NOVO ENGINE COMPANY
200 Porter Street Lansing, Michigan
CLARENCE E. BEMENT, Vice-Pres. and Gen. Manager

FACT 1

5¢ Per Hour

The cost for gas and oil to operate the Novo Flud-Lite Outfit used on this job averaged less than 5c per hour. One gallon of gasoline will generate 1000 Watts for eight hours.

FACT 2

Twenty 75 Watt Lights

Twenty 75 Watt lights with reflectors, strung on 1000 feet of wire were attached to steel fence posts six feet high, set just outside the forms. This provided an abundance of light for the subgrade crew.

FACT 3

No Flickering

Light was flickerless and steady. Because the voltage is held within close limits, no trouble was experienced with burning out of bulbs. The work was never held up due to failing or inefficient light.

FACT 4

Easy To Move

Compactly mounted on a rugged four-wheel truck, the outfit was easy to move as the work progressed. Novo Flud-Lite Units also furnished on skids for mounting on cranes, pavers, shovels and similar equipment.

FACT 5

Timken Equipped Engine

After being supplied with gas and oil at the beginning of the night's run, the Timken Roller Bearing equipped Novo engine required no attention until it was stopped in the morning.

FACT 6

Powers Small Electrical Tools

Novo Flud-Lite Units can also be used to generate electricity for powering small electrical tools having a ⅛ to ½ h. p. motor. Novo outfits are furnished in sizes ranging from 1¼ to 25 KW.

NOVO
FLUD-LITE LIGHTING UNITS

Unload the cement . . . then back for more

CONTRACTORS and builders everywhere are using the Ford 1½-ton heavy-duty express truck to keep their hauling costs low. It is an exceedingly strong and rugged truck, with a wide range of speed and power. Its large and sturdy body is built for rough usage and heavy loads . . . for hauling all kinds of supplies and material. Because of its low first cost, long life, reliability and operating economy, this Ford truck will do your hauling at a very low cost per mile.

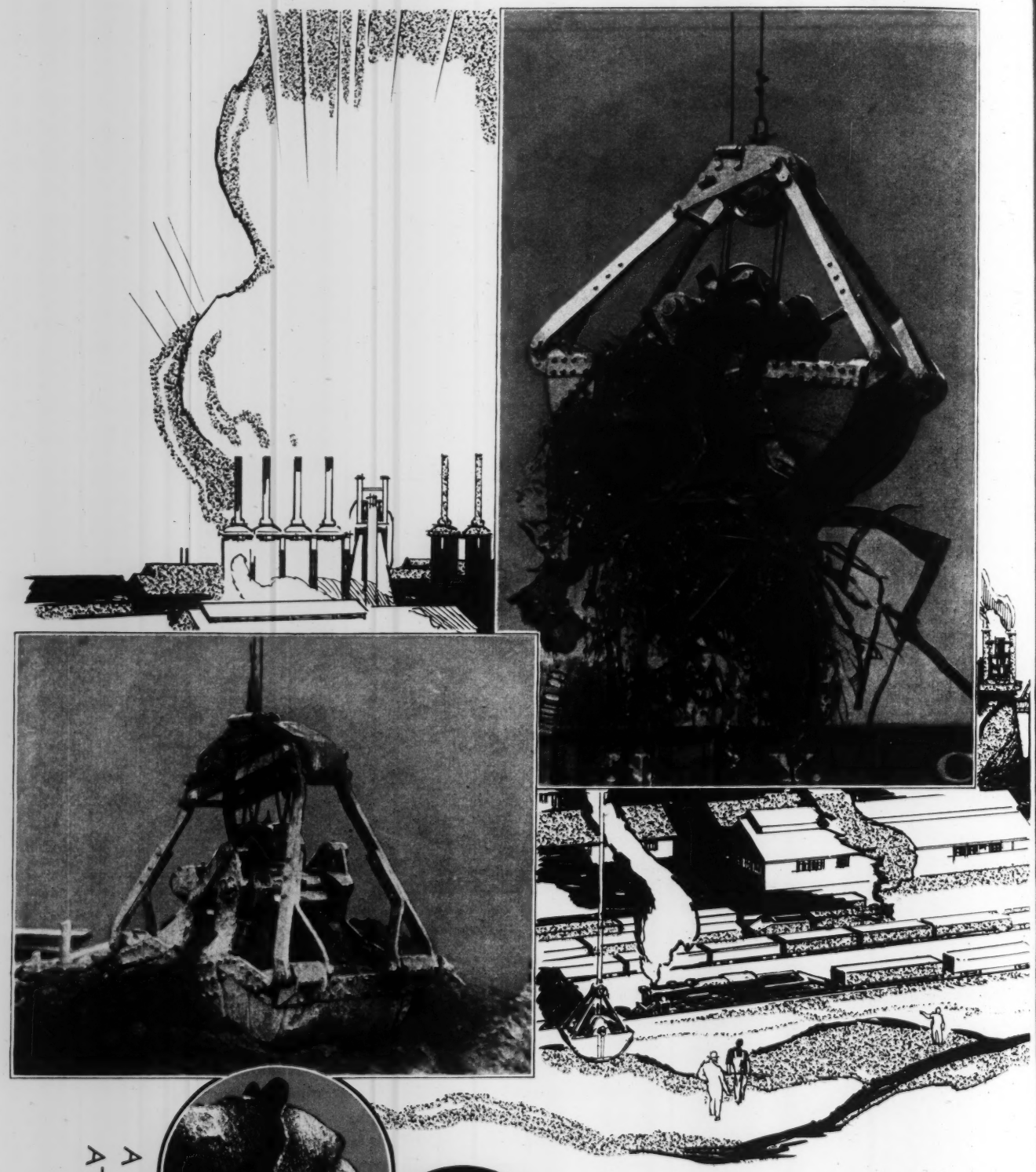
Other Ford trucks that are seeing wide service in construction work are the stake, platform and dump trucks. With the Ford 1½-ton chassis, there is a choice of open or closed cabs, single or dual rear wheels, high or low rear-axle gear-ratios, and 131½-inch or 157-inch wheelbase. All are low in cost, and are available from Ford dealers everywhere. In most principal cities there are centralized exhibits of Ford trucks and light-delivery cars.

Ford heavy-duty express truck

The body is exceedingly rugged, and is designed for carrying heavy loads of any kind of material. It is built of steel over wood, with an especially durable floor-board construction. Sides are 18 inches high, with wide flare-boards. The floor is built of weather-proofed boards, and the joints covered with steel skid-strips, sunk flush and bolted into place. The tail-gate is steel outside over wood inside, with skid-strips protecting the boards. It is equipped with hinges and chains of unusual strength. Special, extra wide fenders, used with dual rear wheels, give full protection.

Among the most valuable mechanical features of the truck are the three-quarter floating rear axle, with spiral bevel gear of special design; the sturdy front axle and spring; the 4-speed transmission; the large, fully enclosed brakes, the same size on all wheels; the Triplex shatter-proof windshield; the 40 kinds of steel, and the more than 20 ball and roller bearings in its construction.

Ford



A MOUTHFUL AT EVERY BITE

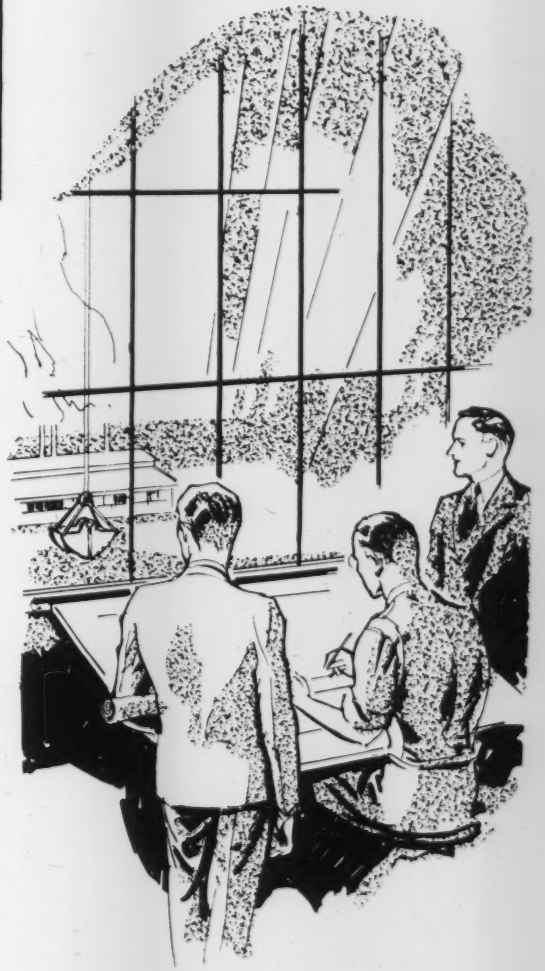
OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAY'S WORK

Owen

These
SPECIAL BUCKETS
are
OWEN ANSWERS TO UNUSUAL PROBLEMS

OWEN has been notably successful in working out special bucket problems—perfecting practical solutions with pre-determined advantages. Cases where the demands are peculiarly different—materials uncommon—digging requirements extra severe—or combination of singular circumstances that call for a clamshell bucket specially designed to perform specific work most economically, then Owen skill is the surest and safest plan.

Send your extraordinary bucket problem along to Owen—give their designing engineers the particulars. They will, in return, give you the benefit of twenty-three years' experience of accomplishments in meeting special—as well as usual—clamshell bucket demands. "A Bigger Day's Work"—that's always Owen's final answer.



The Owen Bucket Company
6011 Breakwater Avenue, Cleveland, Ohio

Buckets

KORITE · USED FOR MANY PURPOSES

Korite is pure asphalt of the highest type and is used for many different purposes.

No. 1 Korite is especially adapted for sealing sewer pipe joints. It forms a leakproof and permanent joint. After setting it will safely withstand the pressures developed, will resist ordinary alkalinity and acidity of sewage and will not become brittle or deteriorate with age. It can be prepared quickly for use and is easily applied by intelligent labor.

ASPHALTS FOR EVERY PURPOSE

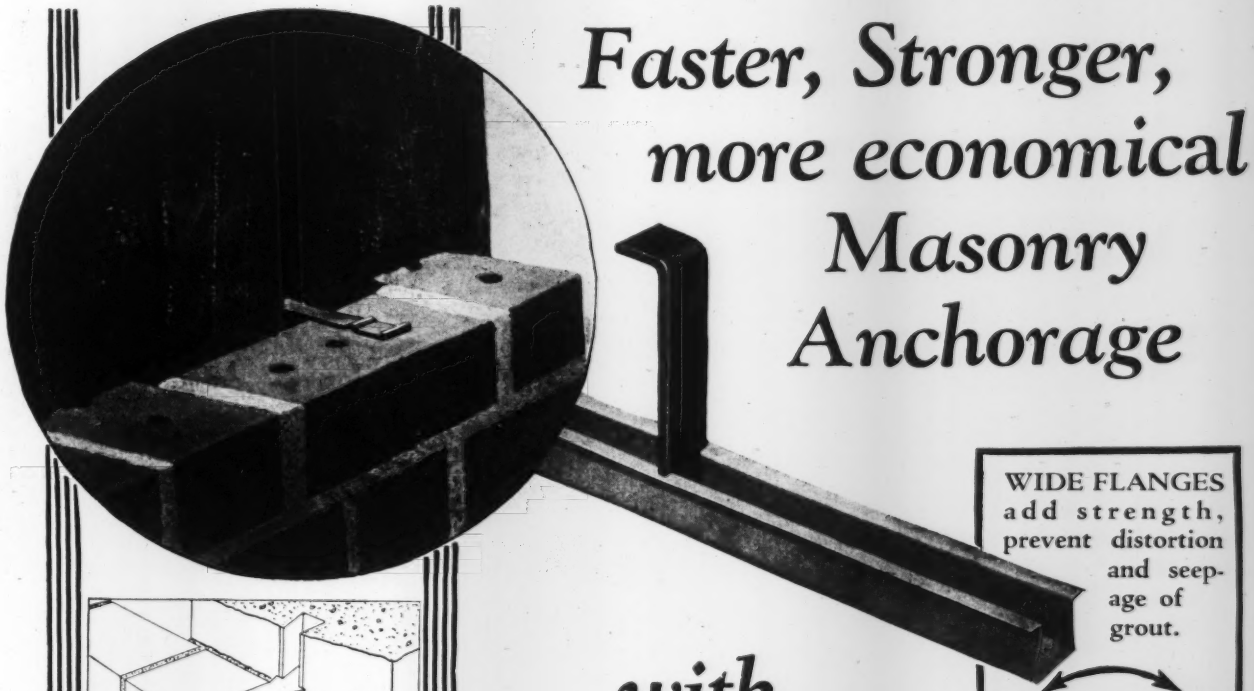
No. 1 Korite and No. 1 Special Korite are ideal for Roof Coating (hot mopping application) used in the construction of built up roofs and for coating and repairing roofs. For maintenance purpose to water tight smooth surfaced roofs (not mineral surfaced) Stanolind Liquid Coating Asphalt can be applied cold with a brush.

No. 1 Korite is used for hot mopping applications for waterproofing steel bridge decks, tunnels, foundations, and construction requiring waterproofing. It is flexible, does not become brittle in cold weather and does not slip or slide in ordinary summer temperatures. No. 1 Korite has high adhesion and excellent weathering properties.

WRITE FOR BOOKLET AND SAMPLES OF THESE PRODUCTS

STANDARD OIL COMPANY
(Indiana)
910 South Michigan Avenue Chicago, Illinois

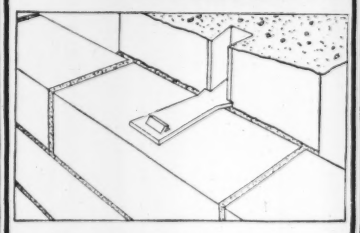
Faster, Stronger, more economical Masonry Anchorage



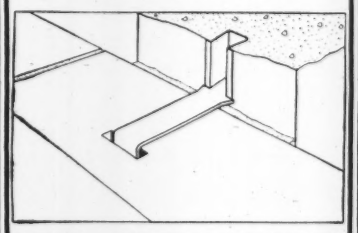
WIDE FLANGES add strength, prevent distortion and seepage of grout.

with

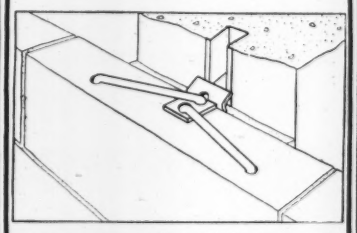
UNIVERSAL Mortise Anchor Slots



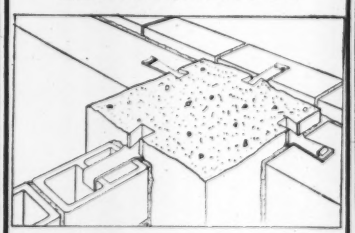
Anchoring brick to concrete. The anchor can be inserted at any height



Anchoring stone to concrete. A twist of the wrist puts the anchor in the slot at any course height



Anchoring terra cotta and tile to concrete. Two rods placed in holes in the anchor which may be inserted at any height hold the terra cotta or tile snugly to the concrete



Anchors in columns with brick facing and tile partition showing the versatility of Universal Mortise Anchor and Slot

Specified by leading architects, used by leading contractors, Universal Mortise Anchor Slots prove to be unexcelled for anchoring masonry to concrete walls, beams, and columns.

They are economical because they do away with measurement of course heights, because they are easily installed, because they are adaptable to brick, terra cotta, stone, or tile, because they eliminate nailing of individual anchors, drilling concrete, and boring holes in forms for wire.

Universal Anchor Slots are simply nailed face down to the inside of the form. After pouring, the concrete holds them firmly in place, the strongest kind of anchor slot. A twist of the wrist puts the anchor in place.

Universal Mortise Anchor Slots are in keeping with modern construction methods.

UNIVERSAL FORM CLAMP CO.
975 Montana Street, Chicago, Illinois
Graybar Building, New York City Williams-Wallace, 160 Hooper St., San Francisco, Calif.

UNIVERSAL
Used by the Nation's UNI-FORM *Construction Engineers*

DeVilbiss

HEADQUARTERS FOR SPRAY-PAINTING AND FINISHING EQUIPMENT FOR THE CONSTRUCTION ENGINEER

EFFICIENT exhausting installations in new or remodeled industrial buildings require special skill and knowledge. Such service is always available to structural engineers through the DeVilbiss organization.

Spray-painting or spray-finishing is an operation which is widely used in industry. It requires the installation of spray booths, the location, size and type of which should be determined before building operations commence. There are many standard types and sizes of DeVilbiss Spray Booths. The DeVilbiss Engineering Department is fully competent to design special booths to meet unusual requirements.

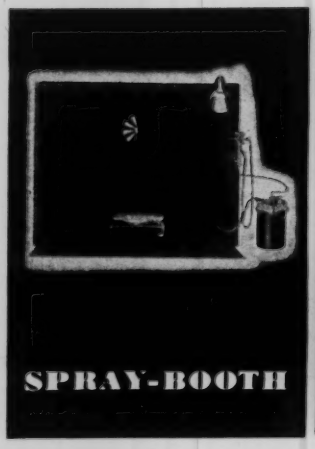
Structural designers and industrial executives, when planning new buildings or remodeling old buildings, will find that later alterations can be easily avoided by early consultation with DeVilbiss engineers—a service which DeVilbiss is glad to offer.

Just call the nearest DeVilbiss office or write,

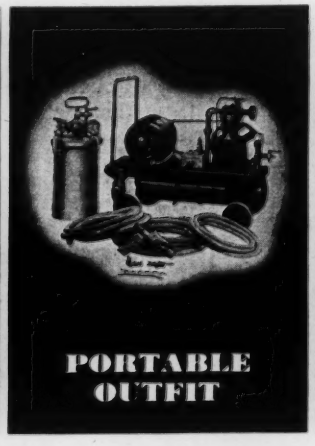
THE DEVILBISS COMPANY . TOLEDO, OHIO

NEW YORK PHILADELPHIA CLEVELAND DETROIT INDIANAPOLIS CHICAGO
ST. LOUIS LOS ANGELES SAN FRANCISCO WINDSOR, ONTARIO

Direct sales and service representatives available everywhere.


SPRAY-BOOTH

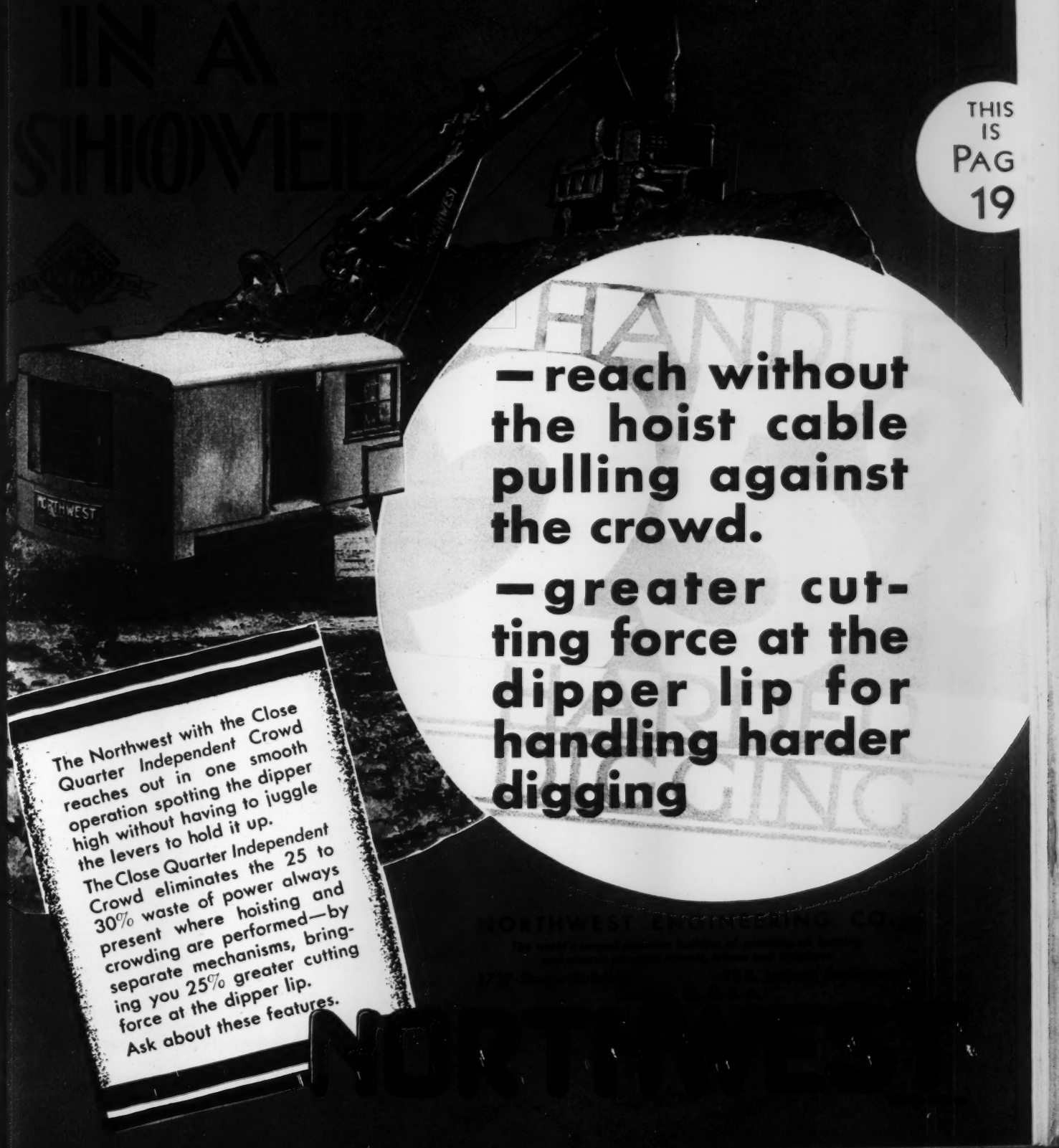
SPRAY-GUN


PORTABLE OUTFIT

QUALITY HOSE

WHAT YOU HAVE ALWAYS WANTED IN A SHOVEL

THIS IS PAG 19



—reach without the hoist cable pulling against the crowd.

—greater cutting force at the dipper lip for handling harder digging

The Northwest with the Close Quarter Independent Crowd reaches out in one smooth operation spotting the dipper high without having to juggle the levers to hold it up.

The Close Quarter Independent Crowd eliminates the 25 to 30% waste of power always present where hoisting and crowding are performed—by separate mechanisms, bringing you 25% greater cutting force at the dipper lip.

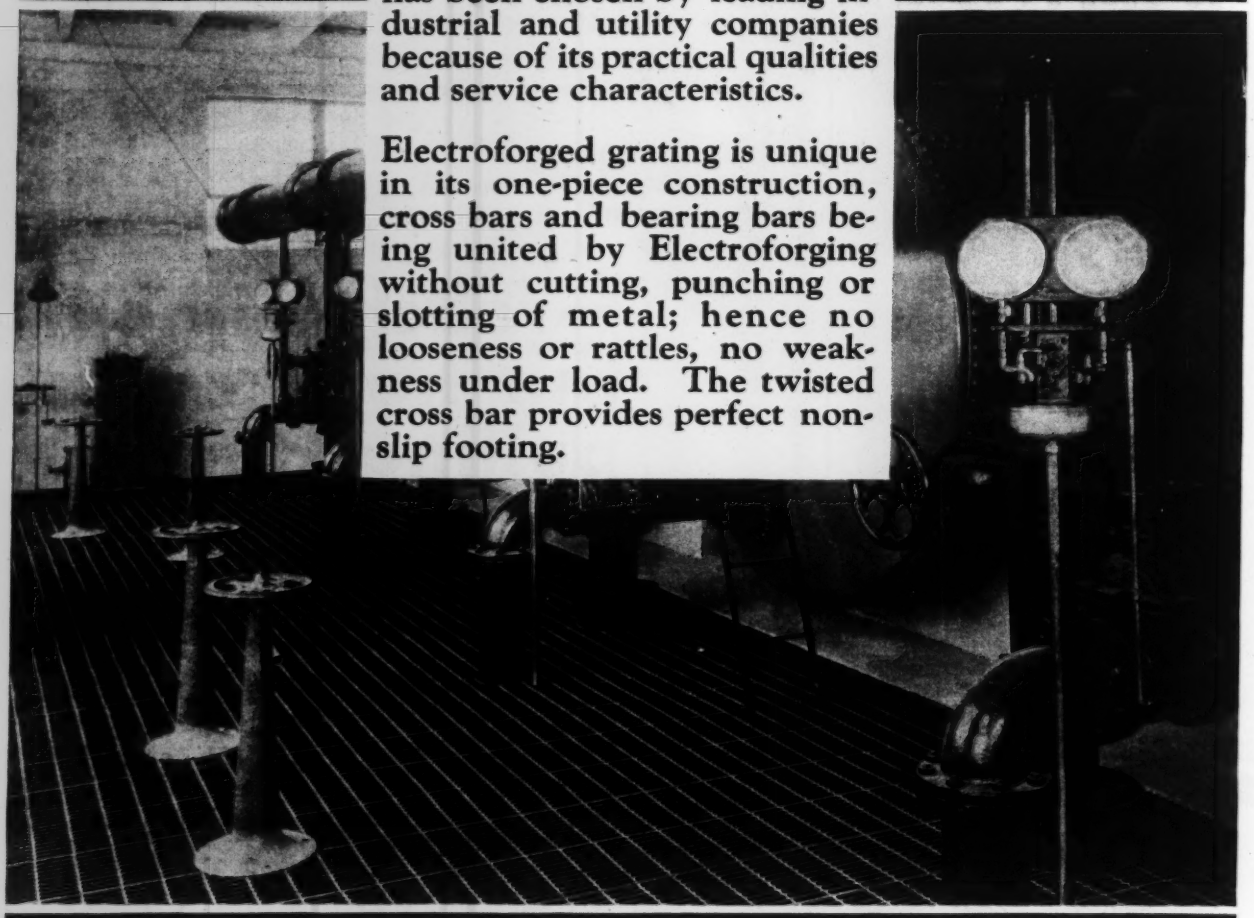
Ask about these features.

NORTHWEST ENGINEERING CO.

NEED A SHOVEL

Electroforged STEEL Grating

NON-SLIP—ONE-PIECE—RATTLELESS



has been chosen by leading industrial and utility companies because of its practical qualities and service characteristics.

Electroforged grating is unique in its one-piece construction, cross bars and bearing bars being united by Electroforging without cutting, punching or slotting of metal; hence no looseness or rattles, no weakness under load. The twisted cross bar provides perfect non-slip footing.

Let us send you sample and catalog --- Just address our nearest office

BLAW-KNOX

2001 Farmers Bank Bldg., Pittsburgh, Pa.

New York Philadelphia Cleveland
Chicago Birmingham Detroit
Buffalo Baltimore

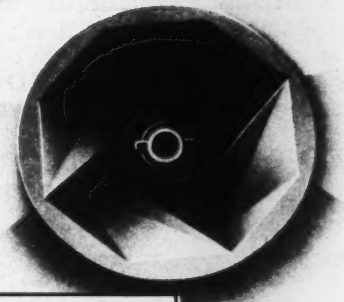
Export Division:
Blaw-Knox International Corporation,
Canadian Pacific Bldg., New York

London, England, New Oxford House, Hart St., Holborn W. C. 1.—Paris, France, 1 Rue de Clichy —Milan, Italy, 6, via S. Agnese, 6—Dusseldorf, Germany, 17 Bismarckstrasse

TRUKMIXER

For the transit mixing of concrete having guaranteed quality

It will make money for you—

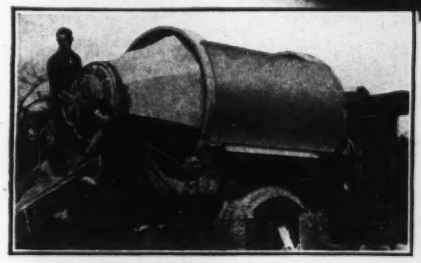


The Four-Point Discharge—the unique blade arrangements accomplish quick, clean and positive discharge of the concrete—without pulsation—controlled by a lever at the rear of the Trukmixer.

It will pay you to obtain detailed information about these exclusive features of the Blaw-Knox Trukmixer:—

End-to-end mixing
Automatic drum reversal
Automatic force feed water measurement
Four point discharge
Ultra rapid mixing action

Years of research and experience in the manufacture of machinery for concreting operations are concentrated in the TRUKMIXER. It represents the ultimate in good automotive construction and long life with low maintenance.



Blaw-Knox Equipment for Ready Mixed Concrete includes:—

Trukmixer and drum type agitator.
Agitator (open type)
Batcherplants
Bulk Cement Plants
Weighing Batchers
Clamshell Buckets

BLAW-KNOX COMPANY
2001 Farmers Bank Building, Pittsburgh, Pa.

Send complete information about the Blaw-Knox TRUKMIXER

Name_____
Company_____
City_____ State_____

BLAW-KNOX

Three Types — MIXER TRUCKS · DRUM TYPE AGITATORS · OPEN TYPE AGITATORS

REO QUALITY IN THE LOWEST PRICED TRUCK FIELD

NEW 1½ TON REO

. . . with a wide range of Reo bodies to fit your needs

In the entire field of low price trucks, only the new 1½-Ton REO SPEED WAGONS embody all these excelling features:

Powerful 4 and 6 cylinder truck engines with *five* and *seven* bearing crankshafts; maximum piston displacements; full force feed oiling even to the piston pins; chrome nickel cylinders that wear seven times longer; extra large 7″ deep frames; full floating rear axles; long, heavy springs; Spoksteel wheels; and large internal, self-equalizing hydraulic brakes!

Wheelbases are longer, with greater loading spaces back of the cab. With this sturdy chassis, Reo is prepared to supply every popular type of panel, stake, express or dump body—also special types for special needs. Prices are low and quality extraordinary.

A drive under load—over test routes of your own choosing—will tell more about the smooth, powerful action of these new

$625

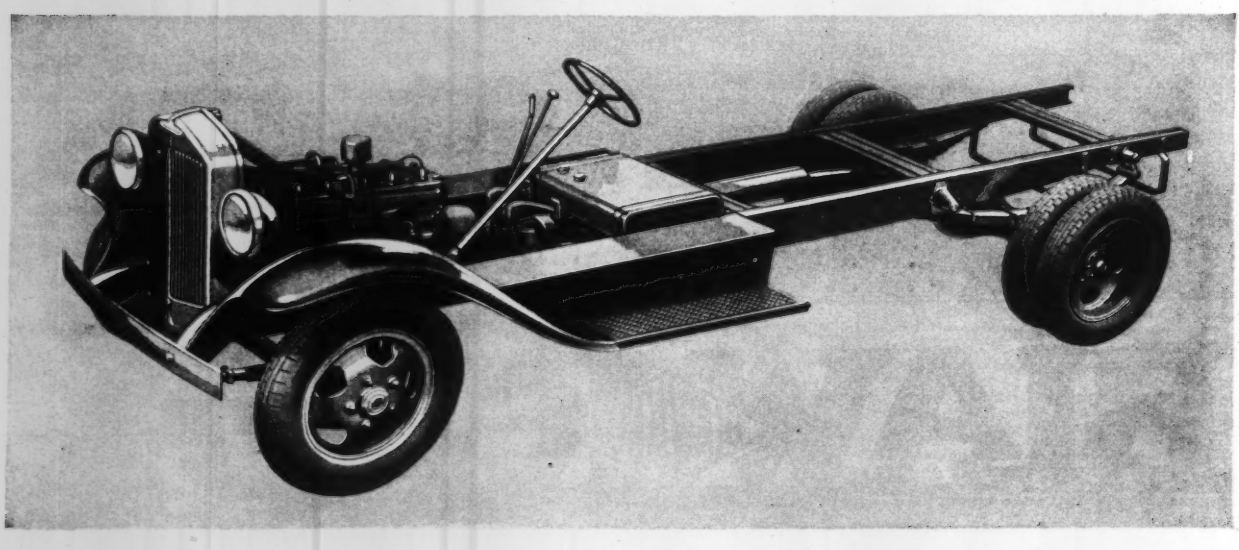
Four-Cylinder $625, Six-Cylinder $725
Chassis f. o. b. Lansing, Michigan
DUAL WHEELS EXTRA

Speed Wagons than words could possibly convey. Note carefully the savings in time and gas—and the *exceptional* size and strength of vital parts.

Any Reo salesman will gladly show you a portfolio which proves, by illustrated life-size comparisons of parts, the real and indisputable margin of Reo superiority.

By all means, see this SPEED WAGON before you buy!

REO MOTOR CAR COMPANY
LANSING — TORONTO



INDEPENDENT CONTROL *is preferred by experienced operators*

THE MAN who operates a crane or shovel is quick to appreciate Browning's Independent Control. He knows the advantage of being able to perform any or all operations independently or simultaneously. He is quick to discover how it simplifies manoeuvering and speeds up operation, enabling him to turn out more productive work with less operating effort. When you are ready for your next crane or shovel purchase don't fail to investigate the exclusive advantages of Browning Independent Control.

THE BROWNING CRANE & SHOVEL CO.
16226 WATERLOO ROAD · · CLEVELAND, OHIO, U. S. A.

Branch Offices:
NEW YORK, N. Y. · CHICAGO, ILL. · ST. LOUIS, MO. · PHILADELPHIA, PA.

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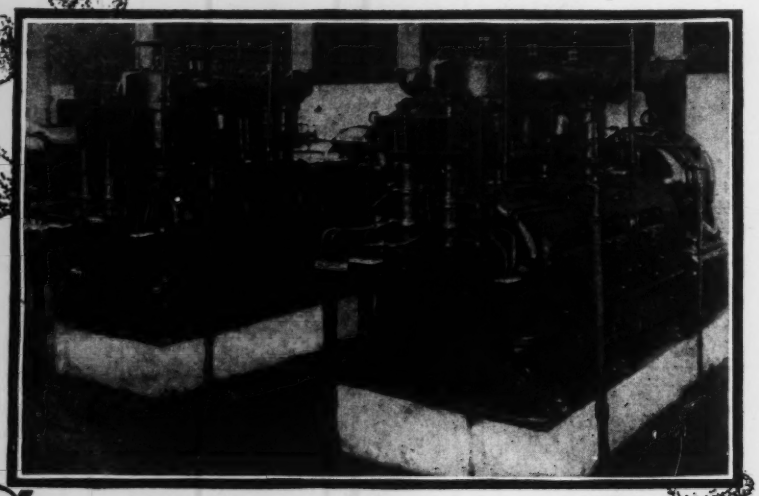
USE BROWNINGS



A "baker's dozen" in AIR COMPRESSOR VALUE

JUST as the old-time baker threw in an extra bun for good measure, so the builders of Westinghouse-National Air Compressors add extra value to the machines they build . . . They save valuable space for the user by designing compact machines that are driven direct by the motor or through efficient herringbone gearing . . . they save installation cost by making complete self-contained machines that need no elaborate foundation nor require extensive auxiliary apparatus . . . they save operating expense by providing complete Automatic Control of distinctive type—which insures that the power consumed will be in proportion to the air compressed . . . they save maintenance expense by building durable machines that will operate for a score of years with minimum time and material for attention and upkeep—thus maintaining the noteworthy tradition of "Quality Machines for Quality Service" . . . Sizes range from 2½ to 700 cu. ft. displacement.

WESTINGHOUSE TRACTION BRAKE CO.

Industrial Division . . . Pittsburgh, Pa.

WESTINGHOUSE-NATIONAL
Air Compressors

SPECIAL
FITTINGS AND CASTINGS

SOMETIMES in meeting unusual conditions it becomes necessary to suspend work while special fittings or castings are made. . . . When such conditions arise, it will be both time-saving and economical to communicate with our nearest sales office. . . . Often-times "Specials" at other foundries are Standard Castings in the "Lynchburg Plants"—but when it IS a "Special," our years of intensive specializing — modern equipment—and hundreds of interchangeable patterns bring to your command a SERVICE not equaled by any other plant.

Bell and Spigot Pipe and Fittings from 4" to 48"
Cast Iron Flanged Pipe from 3" to 84"
Cast Iron Flanged Fittings and Flanges from 1" to 84"
de Lavaud Centrifugal Pipe

LYNCHBURG FOUNDRY CO.

General Office: LYNCHBURG, VA.

Peoples Gas Bldg. CHICAGO, ILL.
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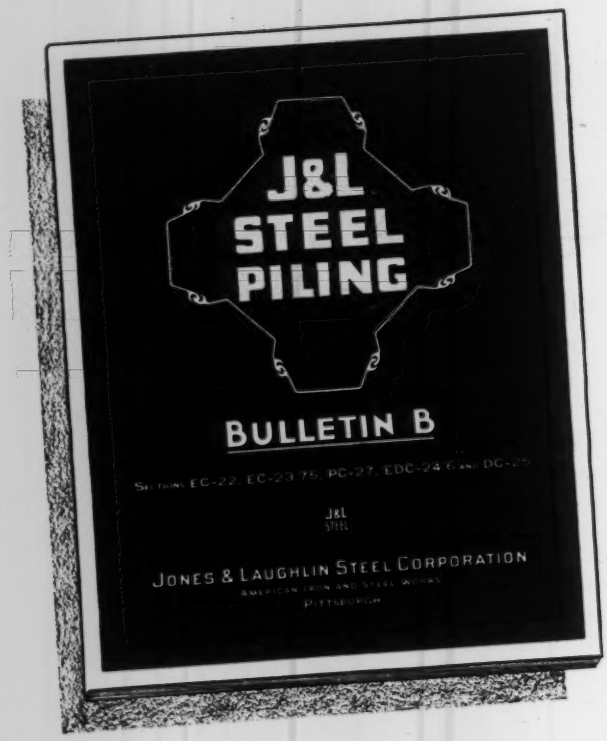
L.F.C.

The Stamp of High Quality and Prompt Service

Now Ready . . . .

J&L STEEL PILING BULLETIN B . . . .



containing complete data and information on J&L STEEL PILING

J & L Steel Piling Bulletin B, a twenty-four page booklet for engineers, contractors and others interested in steel piling projects, is now ready for distribution.

Between the covers of Bulletin B, in compact form, is complete information on the economies that may be effected by use of any one or more of the five J & L Steel Piling Sections—EC-22, EC-23.75, PC-27, EDC-24.6 and DC-25. Examples include designs for cofferdams for various conditions, circular construction applicable to steel piling cylinders for piers and foundation work, corewalls, bulkheads, revetments and for use of J & L Steel Piling braced with I beams. Details of fabricated corners, tees and crosses are also given. Full size detail drawings of piling shanks show the universal interlock of same dimensions, a feature of all J & L Steel Piling Sections. Many interesting photographs illustrate the application of J & L Steel Piling in projects ranging from small temporary work to the tremendous steel piling cut-off walls in the Bonnet Carre Spillway, on the bank of the Mississippi River.

A copy of J & L Steel Piling Bulletin B will be sent you on receipt of your request. There is no obligation.

J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON AND STEEL WORKS

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J & L STRUCTURAL STEEL

J & L STEEL PILING

YES, BUT WILL A TWO-SPEED TRACTION

SAVE ME ANY MONEY?

Time saved is money saved; and the P & H Two-Speed Traction is one of the biggest time savers you'll find on any excavator.

Here's why: in low gear the tractive power of a P & H is three times as great as in high. That means you can climb grades as steep as 25%. It means you can pull through deep mud, steadily and surely. You've got the power to prevent delays even in the toughest kind of going. And in high gear, your P & H will show real travel speeds: the kind that cut down time between jobs by many an hour.

You'll never have to suffer from either lack of power or lack of speed with a P & H. It's one of the many ways P & H designs and builds to save you money, to give you greater yardage at lower cost—first, last, and all the time.

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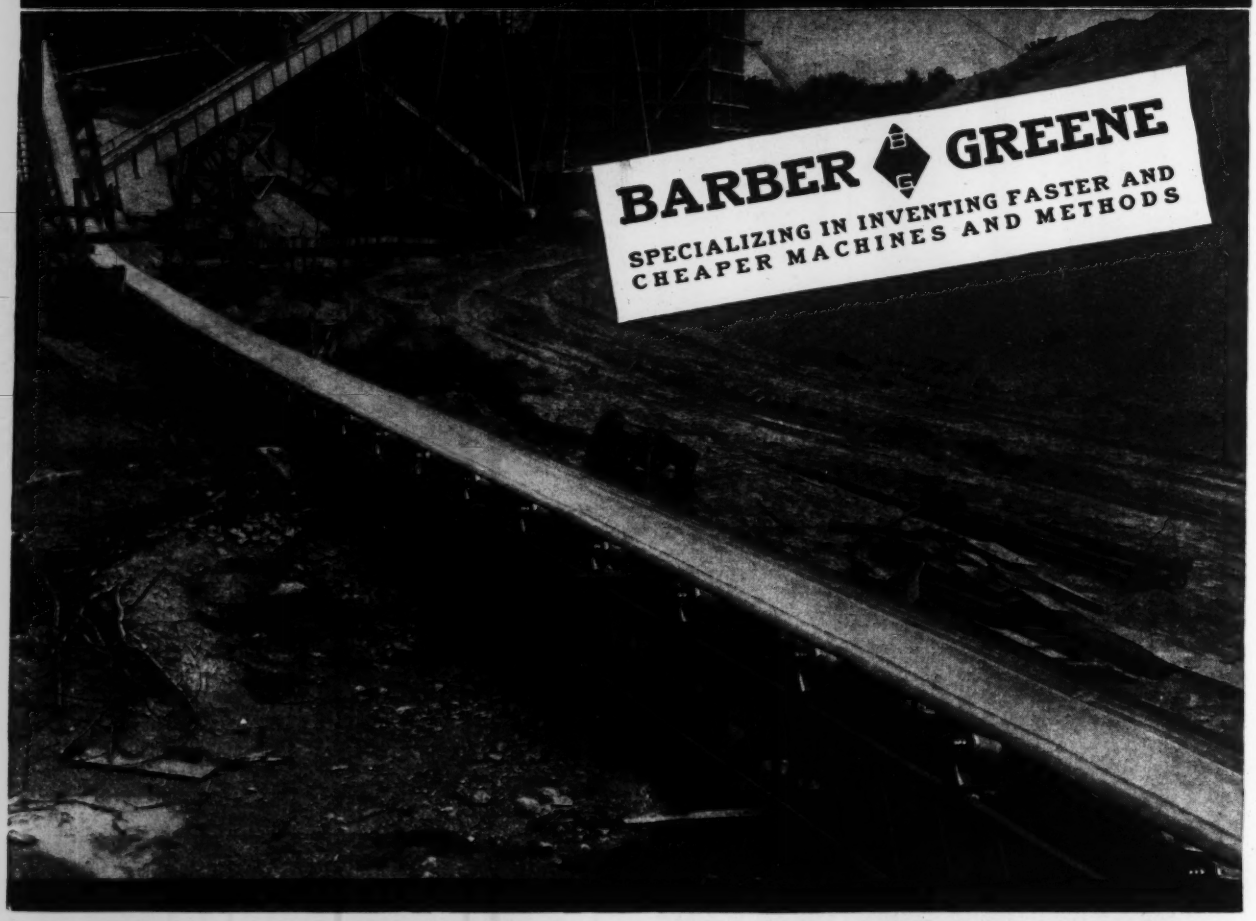
27 STANDARD MODELS $6,500 TO $65,000

SHOVELS · · DRAGLINES · · CRANES · ·

SKIMMER SCOOPS · · TRENCH HOES

FULL REVOLVING MODELS 3/8 TO 3½ CU. YDS. CAP'TY

A Low Cost, Self-Moving Highway, that Comes in "Packages"



A Barber-Greene Permanent Belt Conveyor is the most logical answer for many sand and gravel moving problems.

The standardized frame carries the belt straight and true to wherever you want it to go.

Carriers are correctly spaced always. Belt wear is minimized. Erection is simplified and hastened. And changes can be made quickly and easily.

Because of the sturdy, trussed, standardized frame, Barber-Greene Conveyors ride easily over rough ground, up steep inclines to bins and washers, or overhead. Only a minimum number of ground supports is required. That's another cost saving for you.

And the entire installation comes in pre-engineered, standardized sections. It's like buying conveying systems by the package. Simple, easy, inexpensive. Put the units together and the installation is ready to go.

You can get everything you need: plain or anti-friction carriers. Various belt widths. Standard, heavy-duty or super-capacity framed. And all such accessories as walk-ways, hoppers, skirt boards, discharge sweeps, screw or gravity take-ups, etc.

Ask for the Barber-Greene Permanent Conveyor Book—today. No obligation, of course.

BARBER-GREENE **422 W. PARK AVENUE, AURORA, ILLINOIS**

Bucket Loaders
Coal Loaders
Snow Loaders
Trailers
Loaders with Weighing and Batching Hoppers
Loaders with Vibrating and Grizzly Screens
Coal and Coke Car Unloaders
Permanent Belt Conveyors
Portable Flight Conveyors
Standard Gas and Water Ditchers
Pipe Line Special Ditchers
Belt Car Unloaders
Portable Belt Conveyors
Self-Propelled Flight Conveyors
Utility Special Ditchers
Service Special Ditchers

They had to pull 5000 piles *in three weeks*

IN EGYPT, along the Nile River, during the construction of Nag Hammadi Barrage for the Egyptian Government, some 5000 piles had to be withdrawn in three weeks. At the end of the season's work, temporary piling had to be pulled ready for building the dam for the following season's work. The contractor, Sir John Jackson, Ltd., used a McKiernan-Terry No. 7 Pile Hammer inverted and fitted with pulling atttachment to do this important work. Needless to say, the 5000 piles were pulled in the time allotted.

The Nag Hammadi Barrage is a tremendous undertaking. It serves the purpose of counterbalancing the lowering of the Nile River which will result from the Gebel Aulia Dam, when completed.

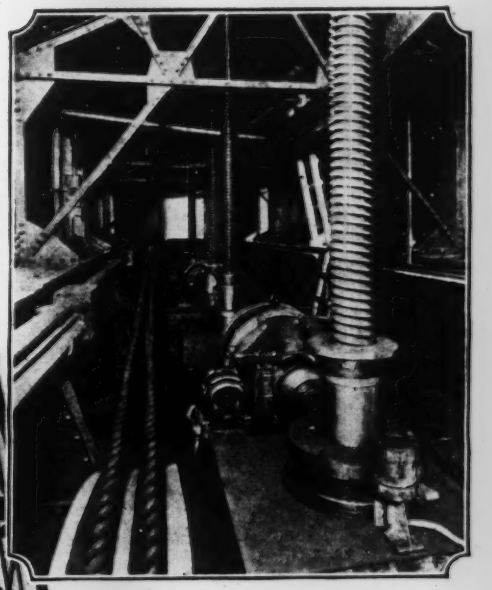
You will always find McKiernan-Terry Pile Hammers driving or pulling on the large construction jobs the world over. Write for McKiernan-Terry Book of Construction Jobs.

McKIERNAN-TERRY CORPORATION

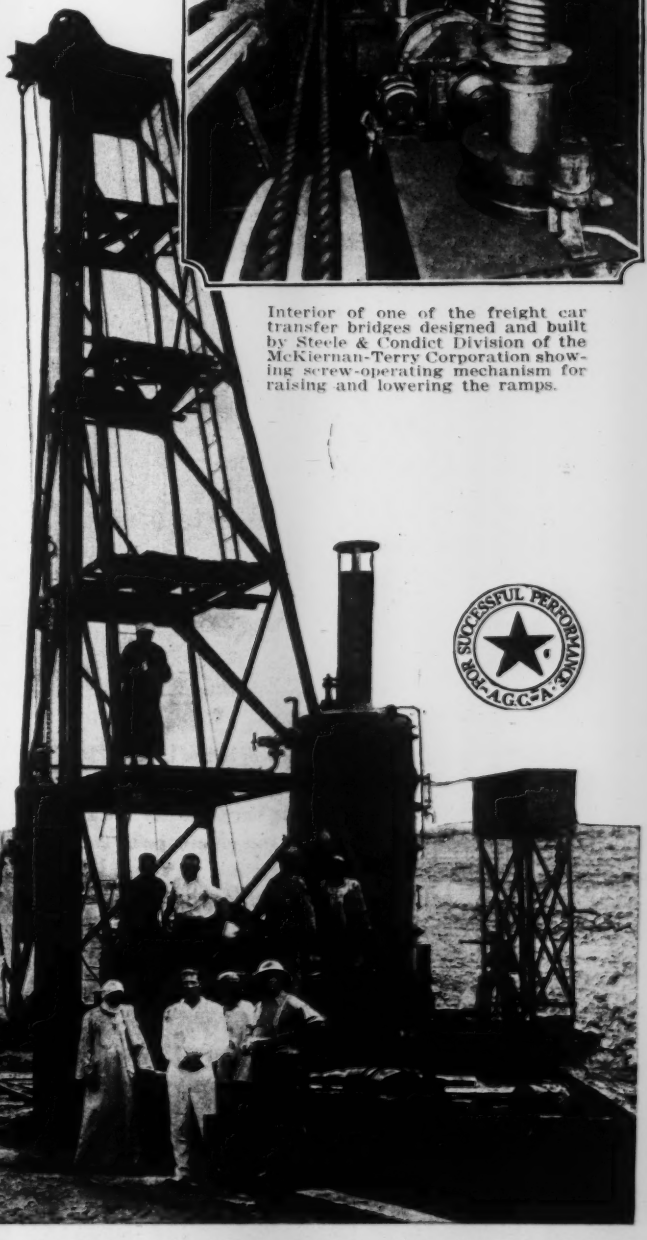
Pile Hammers, Hoists, Derricks and Whirlers

13 PARK ROW, NEW YORK

Distributors in Principal Cities



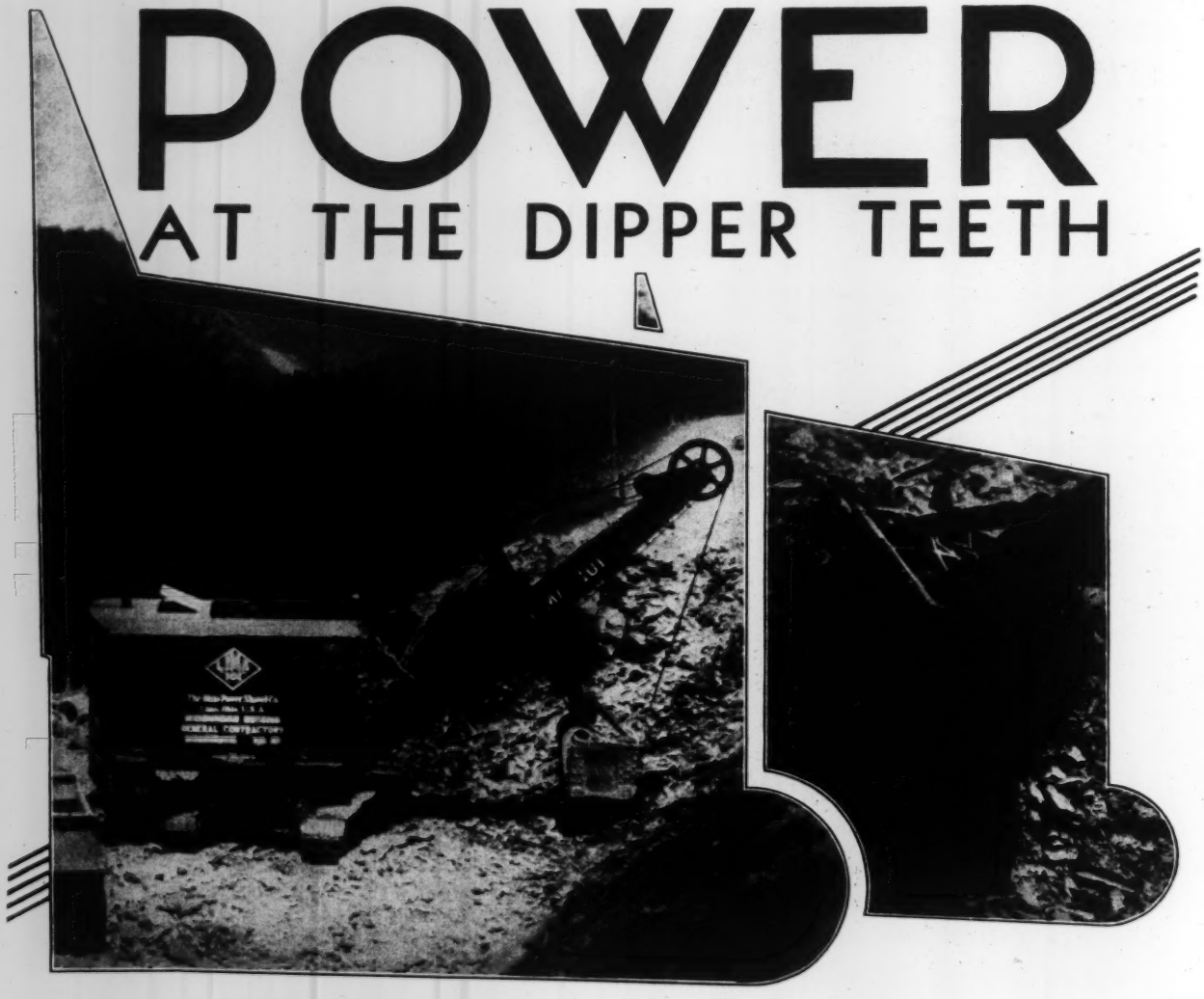
Interior of one of the freight car transfer bridges designed and built by Steele & Condict Division of the McKiernan-Terry Corporation showing screw-operating mechanism for raising and lowering the ramps.



LAMBERT-NATIONAL HOISTS : STEELE & CONDICT MACHINERY

McKIERNAN-TERRY DOUBLE ACTING PILE HAMMERS

POWER
AT THE DIPPER TEETH



THE abundance of power in the LIMA '101' flows without interruption through Timken roller bearings to the very ends of the dipper teeth. This positive and efficient power and the smooth flexible operation of the LIMA '101' patented crowd enables the operator to hold the dipper to the work regardless of how hard the digging. It is no longer necessary to have a shovel with a dipper that jerks through the bank trying to find the points of least resistance. Such inefficiency prolongs your work and cuts down profits.

When buying a shovel, crane, dragline or dragshovel, it will pay to investigate the LIMA '101' —the excavator with roller bearings at every vital bearing point.

THE OHIO POWER SHOVEL CO., LIMA, OHIO
Division of Lima Locomotive Works, Incorporated

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CHICAGO, ILL.

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LIMA "101"

In CINCINNATI . . . a 76-year-old cast iron main is giving A-1 Service

Photo by Fairchild Aerial Surveys, Inc.

● Away back in 1855, the Cincinnati Water Works laid a 20-inch cast iron line under Fourth Street. Today—after 76 years—that identical cast iron line is still in service and is in good condition • • • ¶ From prominent cities in all parts of the country come testimonials to cast iron pipe's long life and low maintenance cost. In Philadelphia, in Richmond, in St. Louis, original cast iron mains are still on the job after 100 years or more • • • ¶ The reason for the long life of cast iron pipe is its effective resistance to rust. Cast iron is the one ferrous metal for water and gas mains that will not disintegrate from rust. This characteristic makes cast iron pipe the most practical for underground mains, for rust will not destroy it • • • ¶ The Cast Iron Pipe Research Association welcomes requests from engineers and city officials for information regarding cast iron pipe for water and gas mains as well as for sewers, culverts and other needs. Address your inquiries to The Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, 122 South Michigan Avenue, Chicago, Ill.

• • •

Cast iron pipe bearing the "Q-check" trademark is obtainable from the following leading pipe founders: Alabama Pipe Company, Anniston, Ala.; American Cast Iron Pipe Company, Birmingham, Ala.; James B. Clow & Sons, 219 N. Talman Avenue, Chicago, Ill.; Donaldson Iron Company, Emaus, Pa.; Glamorgan Pipe and Foundry Company, Lynchburg, Va.; Lynchburg Foundry Company, Lynchburg, Va.; National Cast Iron Pipe Company, Birmingham, Ala.; United States Pipe and Foundry Company, Burlington, N. J.; Warren Foundry and Pipe Corporation, 11 Broadway, New York.

CAST Q IRON

The "Q-check" symbol shown above has been adopted as the trademark of The Cast Iron Pipe Research Association.

CAST IRON PIPE

WHITCOMB

JOINS

BALDWIN

Pioneer in the adaptation of the internal combustion engine to industrial locomotives . . . originator of many outstanding advancements in industrial locomotive design . . . producer of powerful, economical locomotives in sizes from 3 to 80 tons . . . famed wherever industrial hauling is to be done, the Geo. D. Whitcomb Company has reorganized . . . has incorporated as The Whitcomb Locomotive Company . . . has joined the group of manufacturers headed by that ever progressive, hundred year old leader in Motive Power, The Baldwin Locomotive Works. The new executive personnel extends greetings to all Whitcomb clients, both present and prospective.

THE WHITCOMB LOCOMOTIVE COMPANY
ROCHELLE, ILLINOIS

WHITCOMB LOCOMOTIVES

To *Speed* Construction

Before the advent of steel, generation after generation of builders added each its slow contribution to the rearing of a great edifice. Now within the compass of months, vast structures are planned and completed. Simplifying fabrication and erection processes, C B Sections supply man's latest weapon for conquering time. These sections now are rolled on a new mill, located in Chicago, serving the builders of the Central West.

Illinois Steel Company

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

208 South La Salle Street, Chicago, Ill.

U S STEEL

New Edition

Send for your copy

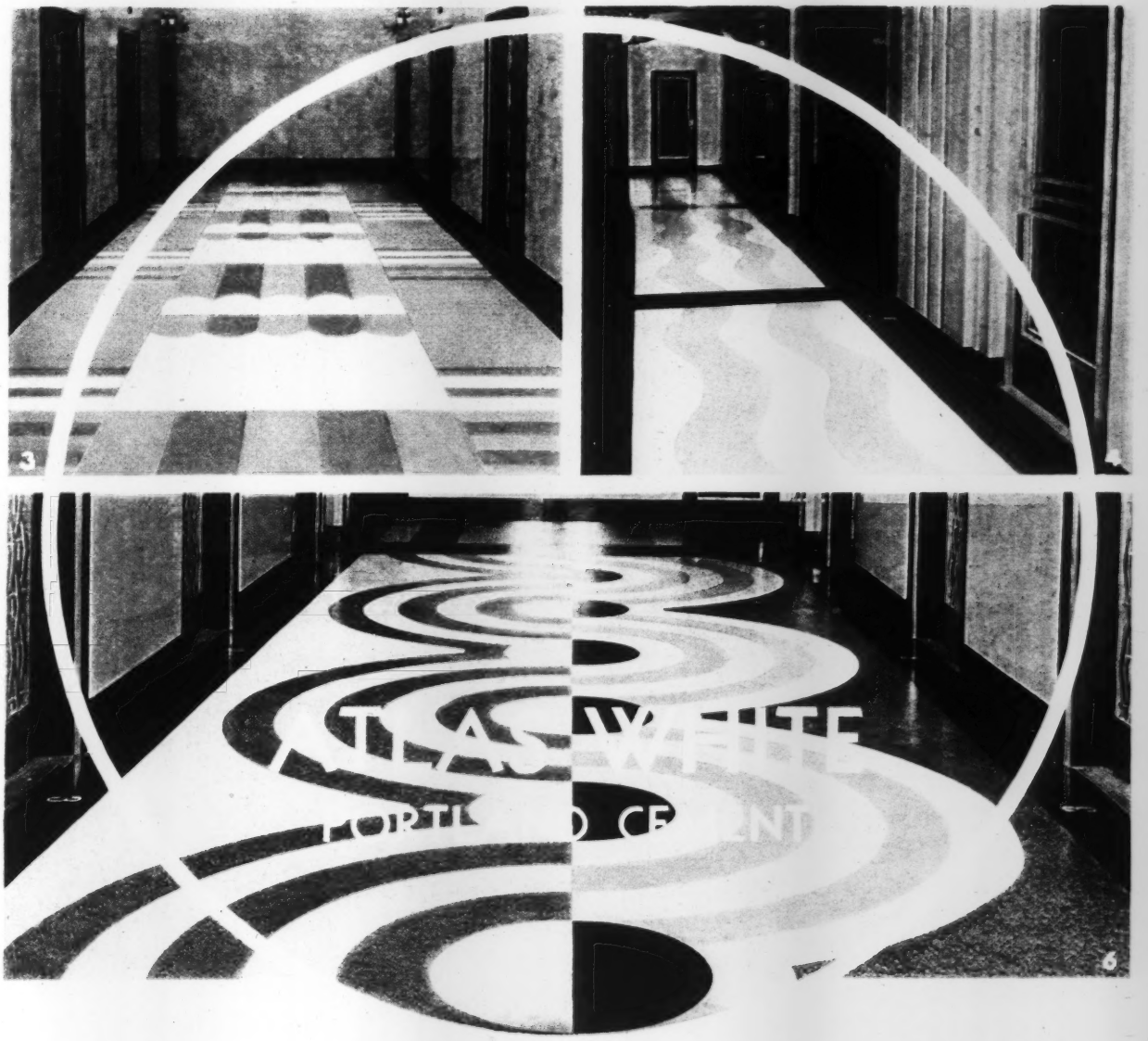
C B Sections

THE floors in the new Board of Trade Building, Chicago, illustrate well the possibilities of Atlas White terrazzo in the modern office building. Here the same striking combination of colors has been carried out in all the terrazzo floors in the building, variety being secured both by changes in the pattern and by omission of one or another of the colors.

Terrazzo floors made with Atlas White portland cement owe their popularity largely to the unusual effects obtained with them and to their lasting beauty. An unlimited range of striking designs and color combinations, harmonizing with any interior or exterior decoration, is always obtainable.

Sharp, clear colors are obtained with white portland cement as with no other. When Atlas White is used for the cement matrix, it brings out in sharp relief

Universal Atlas
U.S. Steel Subsidiary of United



each marble chip and preserves its identity and full color value. Being pure white, Atlas White portland cement insures a clear, true color tone in the matrix itself no matter what pigment is used. Thus any degree of contrast between the matrix and the marble chips may be obtained.

Complete, detailed information on Atlas White terrazzo or on other products made with Atlas White will be promptly furnished on request.

Terrazzo floors in the new Board of Trade Building, Chicago. Holabird & Root, architects; Hegeman-Harris Co., general contractor; John Caretti & Co., terrazzo contractor, all of Chicago.

1. *Terrazzo floor on mezzanine.*
2. *Wide corridor in basement.*
3. *Section of floor in front of elevators in basement.*
4. *Mezzanine, second floor.*
5. *Section of corridor, second floor.*
6. *Section of corridor, third floor.*

Cement Co.
States Steel Corporation

CHICAGO
NEW YORK
PITTSBURGH
MINNEAPOLIS
KANSAS CITY

Name .....
Address .....

UNIVERSAL ATLAS CEMENT CO.
208 S. LaSalle St., Chicago
Without obligation, please send me the booklet, "Terrazzo," E. S. H. 6-25-31

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AMERICAN STEEL & WIRE COMPANY

WIRE FABRIC

ROADS built today must serve the greatly increased traffic demands of tomorrow. Long pavement life and low maintenance costs are of paramount importance—and these essentials are best provided by the use of wire fabric reinforcement. Experience has revealed to highway departments the reliability of American Steel & Wire Company Wire Fabric—as well as the dependable service in back of it.

REINFORCED ROADS ARE PERMANENT

1831 — COMMEMORATING 100 YEARS of PROGRESS in WIRE MAKING — 1931

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago — SUBSIDIARY OF UNITED STATES STEEL CORPORATION — And All Principal Cities

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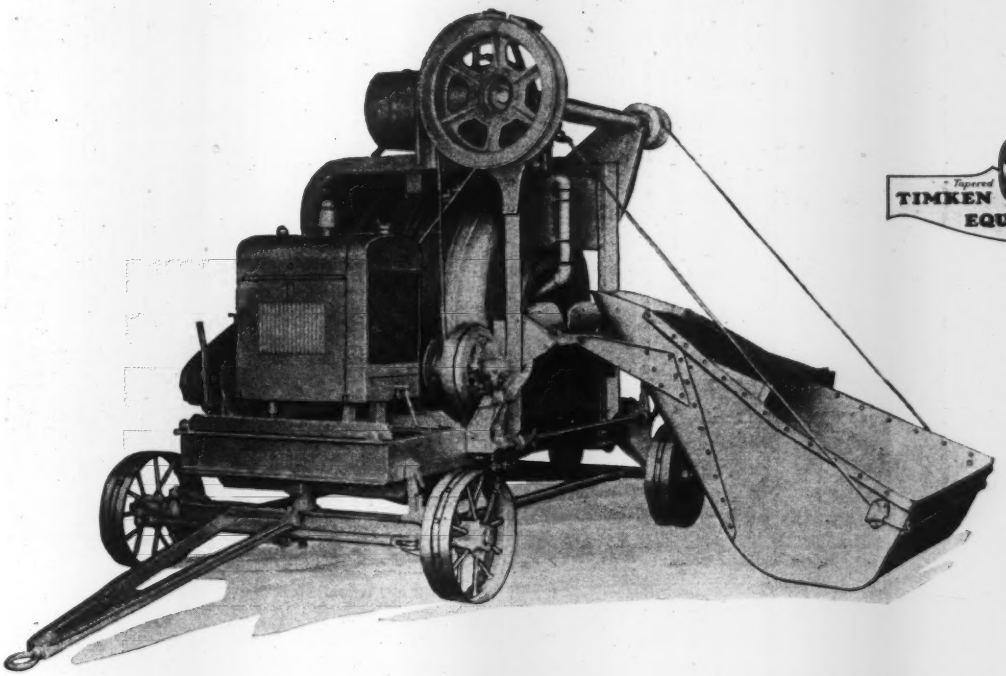


TIMKEN Tapered Roller BEARING EQUIPPED

"Master" and "Wonder" concrete mixers are standardized on Timken Bearings

After long experience with other types of bearings, the Construction Machinery Company found that the exclusive combination of Timken tapered construction, Timken positively aligned rolls and Timken-made steel gives the best assurance of economical operation, dependability, long life and low upkeep cost. Specify Timken-equipped.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

TIMKEN *Tapered Roller* **BEARINGS**

Linde Oxygen

Plants and warehouses in all industrial centers make Linde Oxygen, in the familiar grey and green cylinders, available everywhere at minimum transportation cost. Users also benefit from the unique engineering facilities of Linde Process Service.

Prest-O-Lite Acetylene

Prest-O-Lite Dissolved Acetylene . . . the standard for well over a quarter of a century . . . is available from a Prest-O-Lite plant or warehouse near you. Prest-O-Lite is portable, convenient, economical.

Oxweld Apparatus and Supplies

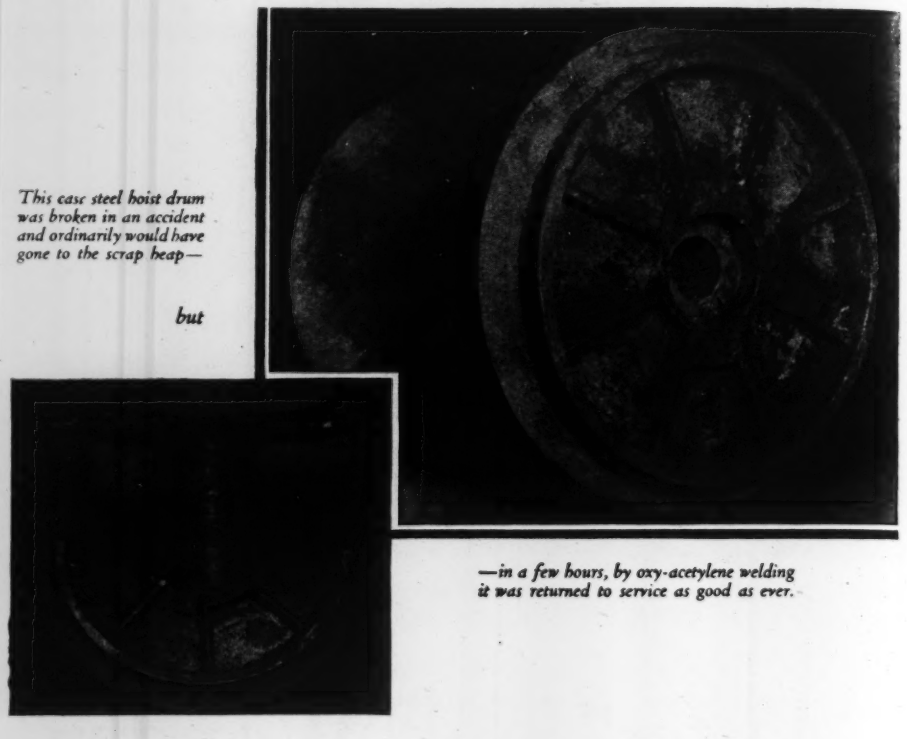
Suitable Oxweld blowpipes, regulators, welding rods and supplies are available for every operation. Complete stocks and service stations are located in all principal cities. Oxweld low-pressure injector type blowpipes, High Test welding rods and other supplies represent maximum values in oxy-acetylene welding and cutting equipment.

Union Carbide

Careful expansion of distributing facilities has made Union Carbide available to every American industry from over 250 warehouse stocks. Sold always in the Blue and Grey drum, it has been the accepted standard for uniform high quality for more than 30 years.

This case steel hoist drum was broken in an accident and ordinarily would have gone to the scrap heap—

but



—in a few hours, by oxy-acetylene welding it was returned to service as good as ever.

Who ever heard of scrapping dividends?

THE scrap pile isn't entitled to dividends but it is getting a good share of your profits if you scrap worn or damaged equipment that oxwelding can reclaim.

The management of a blast furnace found that with the oxy-acetylene welding and cutting process parts formerly discarded could be repaired at a saving of $5,925.00 a month in replacement costs. Thousands of other organizations use oxwelding for maintenance and repair just as effectively—and reduce scrap losses to a minimum.

Oxwelding equipment is inexpensive. Any good workman can be trained to operate it in a relatively short time. The savings that oxwelding can effect in your plant will pay real dividends to you.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

126 Producing Plants UCC 627 Warehouse Stocks

IN CANADA, DOMINION OXYGEN COMPANY, LTD., TORONTO

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	New Orleans	

HAZARD MEETS EVERY CHALLENGE

The Challenge of Economy

Money saved in replacements means more for the payroll and profit column. The antiquated must be junked in favor of the efficient. Especially is this true of replacement purchases—and particularly in regard to wire rope. Wire rope in many industries is a big item of expense.

Hazard's answer to the challenge for greater economy in wire rope is Lay-Set Preformed Wire Rope. Lay-Set will outlast ordinary wire rope two, three and sometimes four times over. Less internal friction and wear—less surface wear—and ability to withstand fatigue due to continual bending stresses are the direct results of preforming.

No internal stress

In Lay-Set, wires and strands are preshaped so they lie side by side naturally . . . without straightening-out tendency. Cut Lay-Set Preformed Wire Rope. You need not seize the end. The fact that wires and strands stay in place is proof that internal stress is eliminated.

HAZARD LAY-SET
PREFORMED WIRE ROPE

HAZARD WIRE ROPE

America's Oldest Wire Rope Manufacturer Since 1846

DISTRICT OFFICES:

Birmingham, Chicago, Denver, Fort Worth, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Tacoma

Mail this Coupon Today!

E. N. R. 6-25-31

HAZARD WIRE ROPE COMPANY
WILKES-BARRE, PENNSYLVANIA

Send me further information about Lay-Set Preformed Wire Rope. This is to place me under no obligation.

Name and Position .....

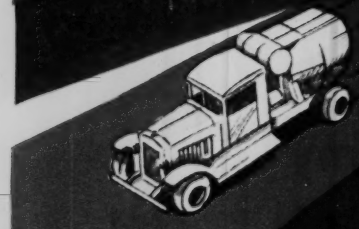
Company .....

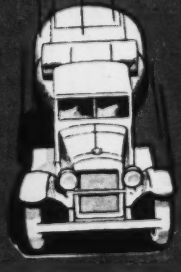
Address .....

Wire Rope to be used for .....

.....

REX MoTo MIXER

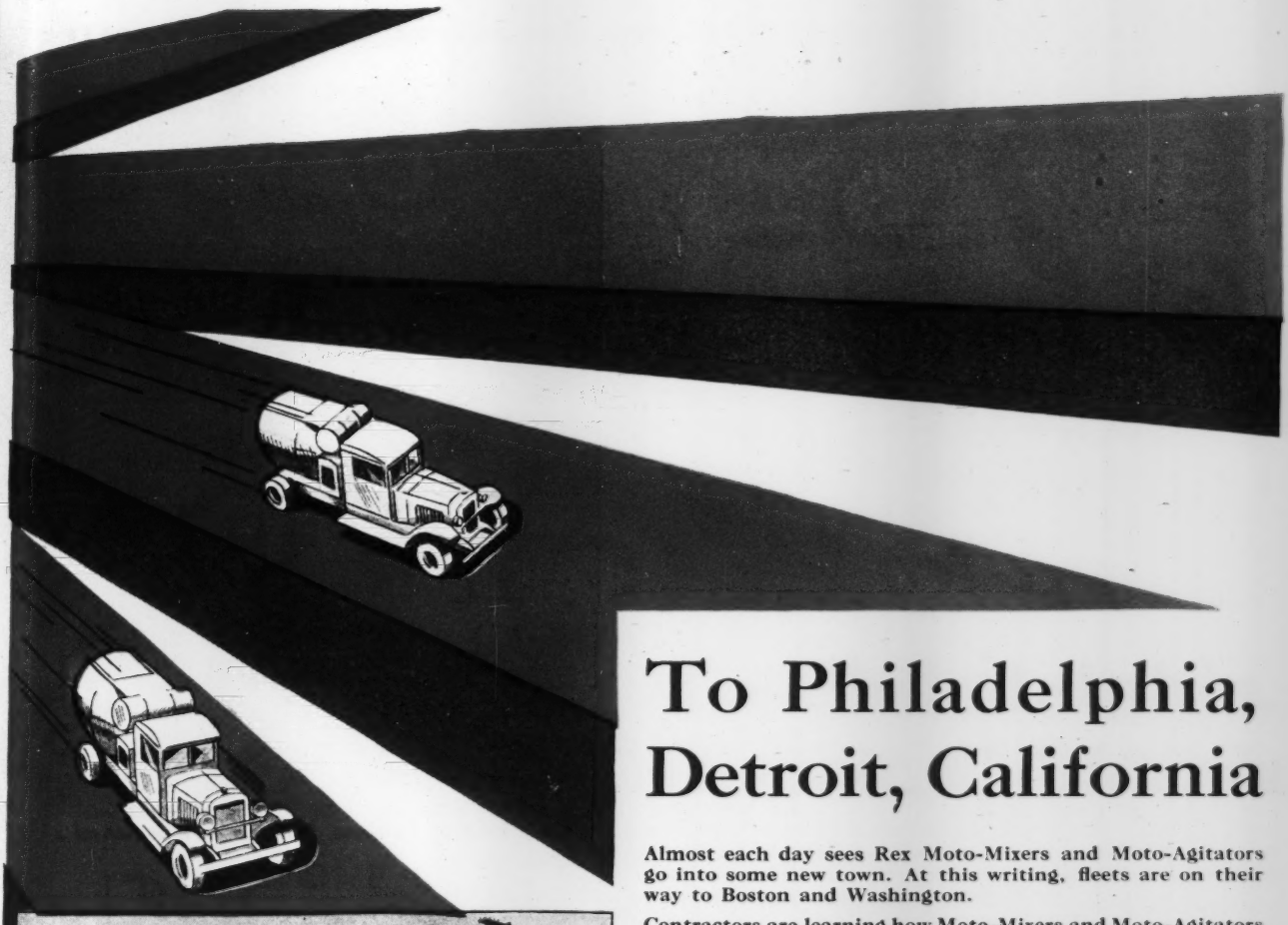




Eight Moto-Mixers of the fleet of the Smith Paving Company, Detroit, Michigan

Three of a fleet of six Moto-Agitators sailing the streets of Philadelphia for Warner Brothers Company

TRUCK MIXERS AND



To Philadelphia, Detroit, California

Almost each day sees Rex Moto-Mixers and Moto-Agitators go into some new town. At this writing, fleets are on their way to Boston and Washington.

Contractors are learning how Moto-Mixers and Moto-Agitators earn profits. Commercial plant operators find more profits in every zone of operation.

Two years on the proving ground, three years on the market, Moto-Mixers and Moto-Agitators are swinging into leadership. They are designed and built to earn profits for you.

They weigh less. They carry greater payloads. They put less burden on their trucks.

They charge faster. Dollars are saved at the batch plant. They discharge over a wide range. More time, men and money are saved.

They have a proved mixing action. Their concrete meets all specifications. Their water control is accurate.

They can be mounted on any truck or trailer, old or new, of proper capacity.

That is why fleets of Moto-Mixers and Moto-Agitators are appearing in towns and cities throughout the United States.

Get complete information today.

Seven Moto-Mixers make up the fleet of the Melrose Building Material Company, Oakland, California

CHAIN BELT COMPANY

1633 W. Bruce St. *Cable Address:* Beltchain Milwaukee, Wis.

CHAIN BELT COMPANY
1633 West Bruce Street, Milwaukee, Wis.
Cable Address: Beltchain

This coupon brings complete information on Rex Moto-Mixers, Moto-Agitators and other Central Plant Equipment.

REX MOTO-MIXERS
Moto-Mixers—2, 3, 4 cubic yard capacities.
Moto-Agitators—3, 4½, 6 cubic yard capacities.
Also: 28-S, 56-S and 84-S, central plant mixers, elevators, cement unloaders, belt conveyors.

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Address .....

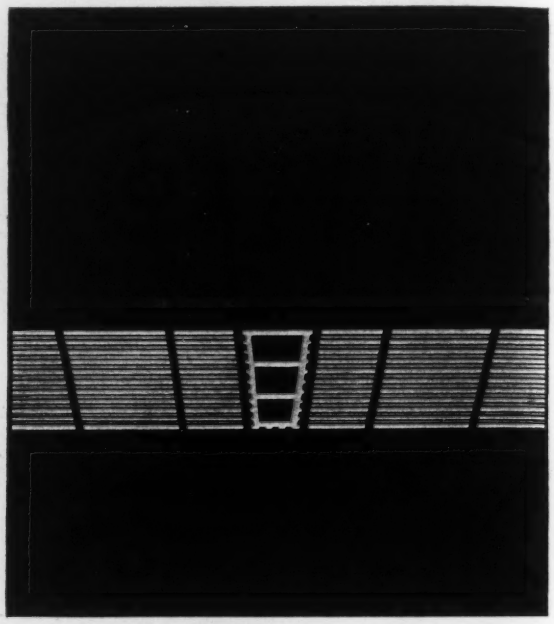
City ..... State .....

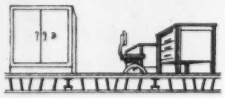
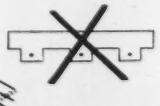
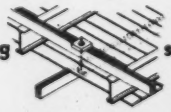
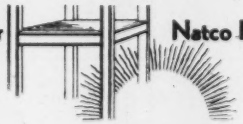
AGITATORS

THE PRESENT DOLLAR MEASURES THE COST - THE FUTURE DOLLAR THE PROFIT

A MODERN ADAPTATION OF AN ANCIENT SUPPORT

Natco FLAT-ARCH FLOOR



A TIME-TRIED, service-proven floor system inspired by the arch, man's oldest and best solution to masonry space bridging problems. Laid out on a section of a theoretical arch eliminating superfluous weight and material, retaining strength  and permanence. Natco Flat Arch needs no reinforcing has no joists  . All stresses are taken by structural units of known and uniform strength. Hung centering  speeds construction, saves cost. Fire resistance assures strictly fireproof construction. Always the speediest construction, Natco Flat Arch is often the only construction; it can be laid winter or summer  Natco Flat Arch offers demonstrated advantages in speed, savings and service.

Natco Flat Arch uses hung centering, keeping lower floors clear. Holes can be left with impunity, for heating, water, soil and electrical lines. Walls can follow the floors. All tile ceiling provides an ideal plaster base. Send for a catalog carrying full details.

The New Use for Natco Clay Conduit—to house cables in masonry walls.

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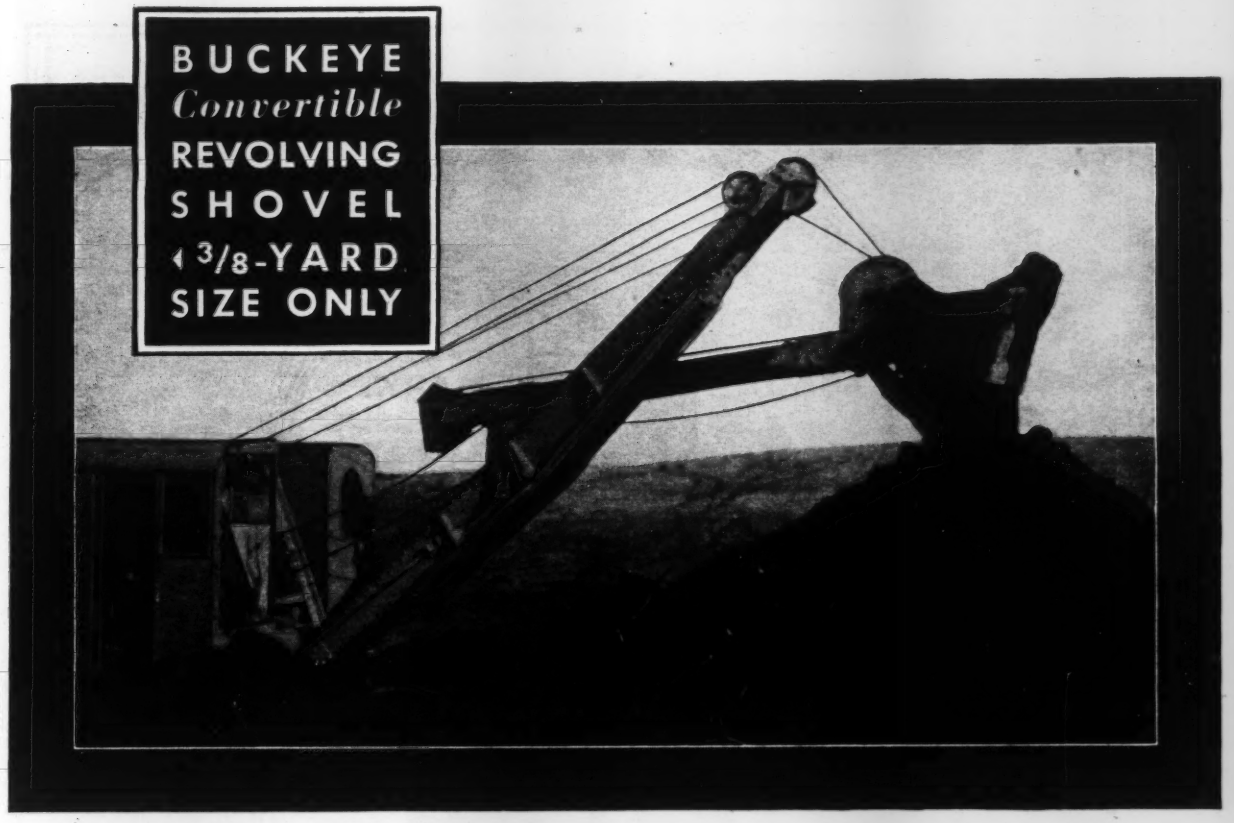
THE *COMPLETE* LINE *of*
STRUCTURAL CLAY TILE

NATIONAL FIREPROOFING CORPORATION

General Offices: Fulton Bldg., Pittsburgh, Pa. Branch Offices: New York, Chanin Bldg.; Chicago, Builders Bldg.; Philadelphia, Architects Bldg.; Boston, Textile Bldg.; Washington, D.C., National Press Bldg.; Birmingham, Ala., Martin Bldg.

The largest concern in the world manufacturing a complete line of Structural Clay Tile and Underground Clay Conduit.



THIS ONE CONSTRUCTION UNIT IS MASTER OF ALL LIGHT MATERIAL-HANDLING JOBS

Compact, powerful and speedy, within its capacity this 3/8-yard full revolving Buckeye combines the duties of a Shovel, Crane, Clamshell and Dragline all into a single construction unit. It is readily convertible to any or all of these services as required in a day's activity. *More,* its skillful design and rugged strength qualify it to give profitable performance continuously.

Excluding boom, the height of Utility Buckeye is 9 feet 7 inches. Width overall, 7 feet 5 inches. Swinging radius—center pin to rear end, 7 feet 4 inches. Center pin to boom hinge, 28 inches. Weight, with shovel attachments, 15 tons.

One-piece manganese steel dipper has a capacity of .444 cubic yards, struck measure; its removable teeth are reversible and its cutting angles adjustable. 19-foot rigidly reinforced boom is permanently aligned. 12-foot double dipper stick, provided with swiveling guides, passes inside of boom. 54 h. p. heavy duty gasoline motor, electrically started, forms a complete assembly with the radiator, clutch and 2-speed transmission. Rotating and traveling bases are one-piece electric castings. Power steering, with each steel-treaded Alligator crawler independently driven. Cab lights are standard equipment. Easy, positive one-man control.

May we send you complete specifications and the attractive price of this handy Shovel-Crane?

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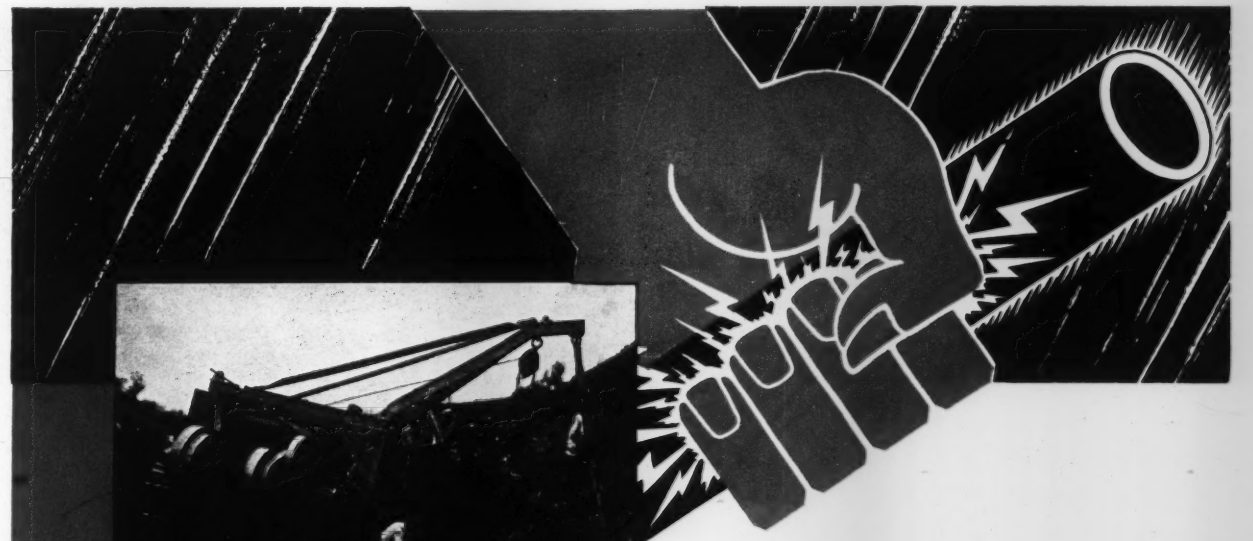

Field Crew handling 8-5/8" Republic Electric Weld Pipe . . . Phillips Pipe Line.

Welding Line Welding of five joint sections Republic Electric Weld Pipe . . . Prairie Pipe Line.

Lining up butt section of Republic Electric Weld Pipe . . . Shelly Oil Line.

It's What THEY *Say . . . Not What* WE *Say, that Counts.* Ask any crew that has worked with Republic Electric Weld Pipe how it compares with ordinary line pipe and, out of their experience, this is what you will be told.

Because it is made in long lengths, fewer joints are needed. This means savings in time, in handling, in couplings, in welding, labor and materials. Because it is uniform in thickness and perfectly round, it can be bent with more accuracy, with less spoilage, and joints can be welded with more ease. Because of its perfect welds and high ductility, it is a real trouble saver during the installation period and in actual service.

Republic Electric Weld Pipe, the outstanding recent development in pipe making, is available in sizes up to 16 inch O. D., in lengths up to fifty feet, every length tested and free from scale. Your crews will work better, faster, with this better pipe.

REPUBLIC
ELECTRIC WELD
PIPE

MADE BY A NEW PROCESS CONTROLLED EXCLUSIVELY BY REPUBLIC STEEL CORPORATION YOUNGSTOWN, OHIO . . . . .

REPUBLIC STEEL
CORPORATION
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LINK-BELT

"AT HOME AMONG THE ROCKS"

THIS Link-Belt K-55 two-yard shovel owned by W. H. Puckett Company, of Boise, Idaho, is right in its element, excavating rock in one of the West's biggest railroad building projects in a generation — the Northern California extension of the Western Pacific Railroad, a 14 million dollar project.

Tough digging in all kinds and variations of rock, including volcanic, is encountered on the job.

Six other Link-Belts are also working on this development, doing heavy grading work, making rock cuts, terminal and yard construction for the following contractors:

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Morrison-Knudsen Co.
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The Link-Belt Shovel is no "ordinary" machine. It is built *good-all-the way-through* —an ideal combination of features in design and construction that make for dependable, economical, continuous service on the hardest jobs. Range of sizes is up to 2½ yds. capacity, heavy duty. Send for a copy of book No. 1095.

LINK-BELT COMPANY
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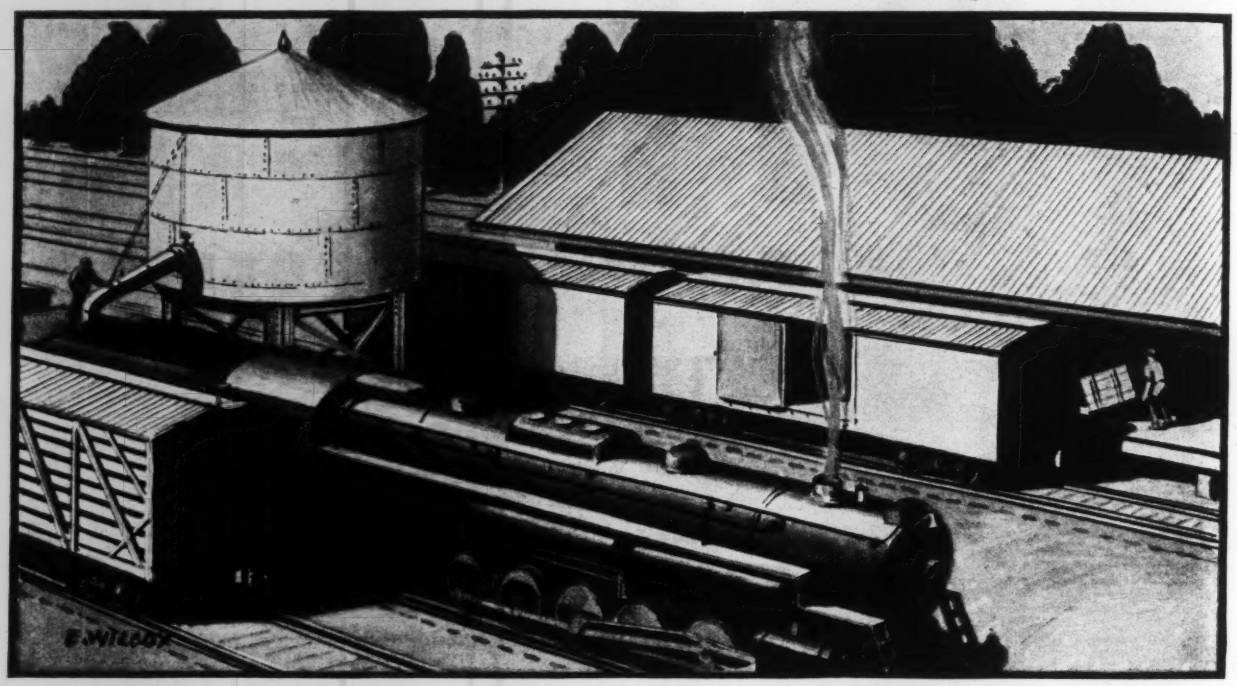
SHOVEL - CRANE - DRAGLINE

Where Exposure is Greatest



Inland Copper-Alloy Steel Sheets provide superior endurance and protection when used for roofing and siding freight and warehouses, as the steel for water-towers, for locomotive jackets, for roofing freight cars . . . as well as in any other outdoor application.

INLAND COPPER ALLOY STEEL

FROM BUREAU OF STANDARDS CIRCULAR LETTER NO. 253

In circular letter No. 253, the Bureau of Standards quotes Dr. F. N. Speller's book "Corrosion—Causes and Prevention" in summarizing the effect of the composition of steel on its corrodibility. Dr. Speller states that copper increases the corrosion-resistance of steel exposed to atmospheric conditions—that the effect of copper is much more marked than the purity of steel or iron.

INLAND COPPER ALLOY STEEL SHEETS

IN structures like freight and warehouses, granaries, water tanks, their contents make protection doubly vital. Yet these structures are subjected continuously to the ravages of the elements.

The greater the need for protection, the greater the need for Inland Copper-Alloy Sheets. Unbiased exposure tests have proven conclusively that copper-bearing steel sheets are superior in resistance to corrosion. And, where immediate expense is important, it is well to remember they are lower in first cost, in upkeep, than any other corrosion-resisting sheets.

Inland Copper-Alloy Sheets are available in black or galvanized, in all standard gages. Their uniformity, their dependability, are assured by Inland's resources, research, inspection-standards, by Inland's processes controlled from mine to finished sheet. This and other Inland products are described in the booklet, "Inland Open-Hearth Sheet-Steel Products". A copy will be sent on request. INLAND STEEL COMPANY, 38 South Dearborn Street, Chicago, Ill.

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Rails Rivets Billets Track Accessories

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ECONOMY and dependable performance are of prime importance in the selection of your water supply system. That is why industries of all types all over the world have placed their O.K. on Layne Well Water Systems.

A completed Layne Well System represents the greatest achievement in hydrological engineering. There is no other method whereby water can be produced in as large quantities as economically as by the Layne System.

In contracting for a Layne Well System you get:

A guaranteed amount of water at a stipulated price.

Lowest pumping costs.

An operating well system delivering a guaranteed amount, one company handling the entire job and assuming all responsibility.

If the amount of water guaranteed is not obtained you pay nothing! The basis of a Layne contract is "Water Or No Pay."

For further information write to the Layne Associate Company in your territory or to LAYNE AND BOWLER INCORPORATED, Memphis, Tennessee.

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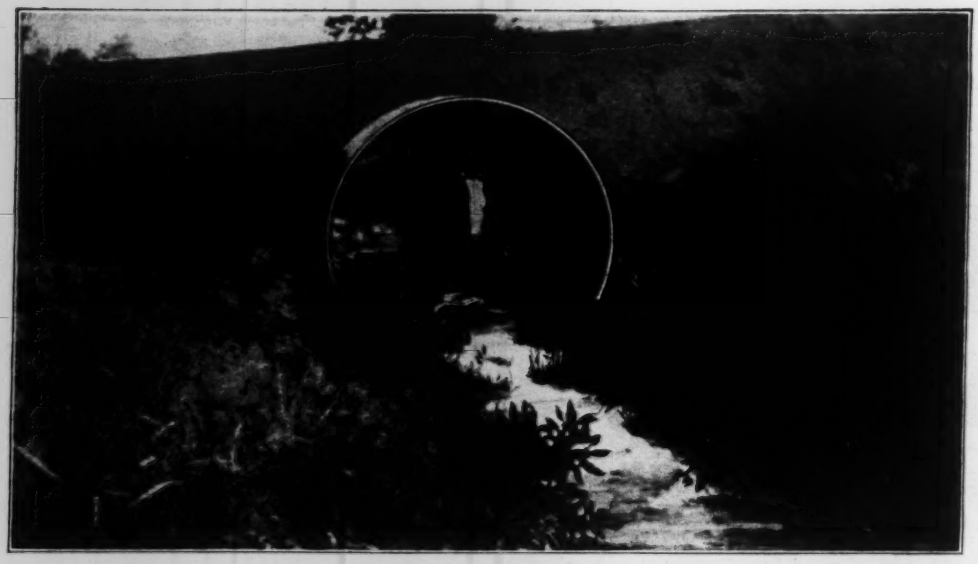

This 96" GOHI Corrugated Culvert was installed in Wake County, N. C., in 1912. It is in perfect condition today — shows no wear at all — after battling corrosion and weather for 19 years.

Here is the EVIDENCE You Want - in the Ground!

IT is the Pure Iron alloyed with the right amount of copper that gives GOHI Corrugated Culverts their rust-resisting and lasting qualities. The guaranteed analysis of GOHI base metal is 99.90% Pure Iron-Copper Alloy. Greater purity cannot be produced except by laboratory methods, and science to date has not produced a culvert metal with higher resistance to corrosion and weather. For nearly a quarter century, GOHI Culverts have been demonstrating their low-cost-per-year service. Write today for full information.

GOHI CULVERT MANUFACTURERS, Inc.
Newport, Kentucky

GOHI FABRICATORS

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Central Culvert Co.
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Roanoke Sales Corp.
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GOHI Culverts meet copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.

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TRADE MARK
PURE IRON - COPPER ALLOY
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GOHI
PRONOUNCED "GO-HIGH"
Corrugated CULVERTS

IT is a far cry from the little red schoolhouse of our fathers' time to the magnificent new 40-story Cathedral of Learning of the University of Pittsburgh. This imposing structure not only typifies the advance in education, but the great progress in building construction as well. It is fitting indeed that in the City of Steel, its University should be housed in the most spectacular contribution Steel has made to this generation . . . the skyscraper.

CB Sections, representing the most recent improvement in structural steel, were used in the construction of the Cathedral of Learning. A vast number of important educational structures throughout the country testify to the popularity and merit of CB Sections.

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CB SECTIONS

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Photo Courtesy Chicago Northwestern R.R.

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But too often these brief snatches of recreation are clouded by the uncertainty of deliveries. When steel is concerned, it is best to buy from a dependable stock source so you may really enjoy your vacation.

Before You Go—

Give the vacation order that eliminates all worry over steel deliveries.—"Call Ryerson when steel is needed." You can depend on immediate shipment of every requirement.

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STEEL-SERVICE

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1. Unusually compact ¾ or 1 yd. convertible shovel. Distance from boom base to center of rotation is only 30 inches, assuring unusual stability.
2. New design of crawler steering mechanism permits quicker and easier steering or turning.
3. Large heavy cast roller path 76-in. in dia., mounted on unit cast car body, prevents rocking.
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6. Eight inch diameter center pin, threaded, with adjusting nut.
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11. Line speeds unsurpassed.
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16. All clutches external band type, powerful control, easily relined.
17. Large swing clutches, 18-in. dia., 4-in. wide.
18. Silent chain drive from the motor.
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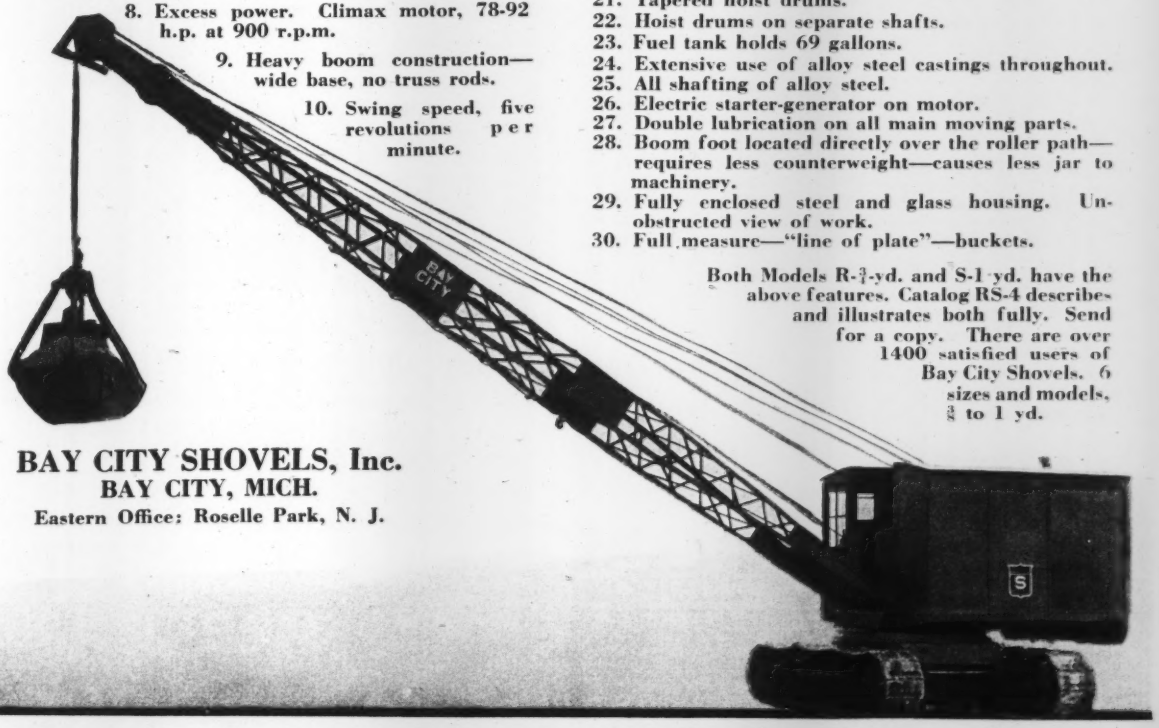
20. Positive swing lock (exclusive).
21. Tapered hoist drums.
22. Hoist drums on separate shafts.
23. Fuel tank holds 69 gallons.
24. Extensive use of alloy steel castings throughout.
25. All shafting of alloy steel.
26. Electric starter-generator on motor.
27. Double lubrication on all main moving parts.
28. Boom foot located directly over the roller path—requires less counterweight—causes less jar to machinery.
29. Fully enclosed steel and glass housing. Unobstructed view of work.
30. Full measure—"line of plate"—buckets.

Both Models R-¾-yd. and S-1-yd. have the above features. Catalog RS-4 describes and illustrates both fully. Send for a copy. There are over 1400 satisfied users of Bay City Shovels. 6 sizes and models, ¾ to 1 yd.



BAY CITY SHOVELS, Inc.
BAY CITY, MICH.
Eastern Office: Roselle Park, N. J.

BAY-CITY SHOVELS

THE BAY-CITY FAMILY OF FAST WORKERS

How to appraise all kinds of property

a practical handbook—just published

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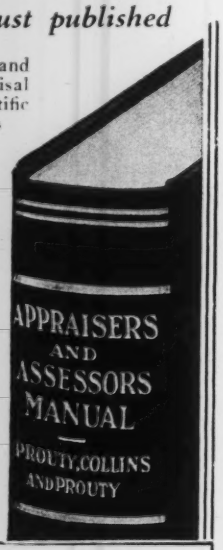

Appraisers and Assessors Manual

by W. L. PROUTY
Member of firm Prouty Bros. Engineering Co., Denver

CLEM W. COLLINS
Manager of Revenue and Assessor, City of Denver; Member, Collins, Witting & Co., C.P.A.'s, Denver

and FRANK H. PROUTY
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For six years the authors have been compiling data from hundreds of sources in every part of the United States on the most modern methods of appraising, especially for taxation purposes. The best features of existing systems have been included. Many new and original rules, tables, charts and illustrations are to be found in this volume.

Standard methods for the classification of land and buildings are made clear by definite rules, charts and illustrations. The difficult subject of physical and obsolescent depreciation of buildings is given thorough and detailed consideration. New charts for the rapid calculation of building values have been devised. Complete examples for the valuation of various types of buildings are given. Definite rules are laid down for the valuation of land. Valuable information on the cost of machinery, data on the appraisal of office, household and hotel equipment and fixtures, are among the new material published in this book.

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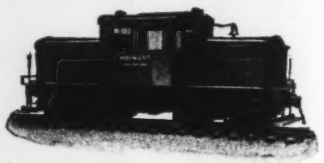

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They haul heavier loads faster—and do it on less fuel, less maintenance and less overall cost. They are built in sizes from 4 to 80 Tons—Gasoline, Diesel, Gas-Electric and Diesel-Electric—a type and size for every need.

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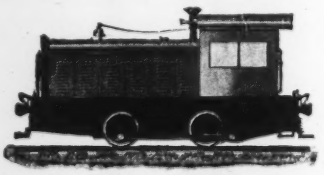
Hamilton Ohio



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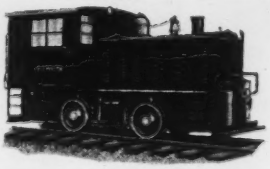

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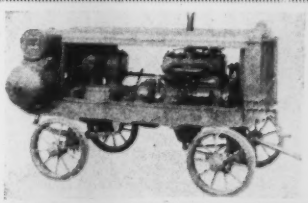

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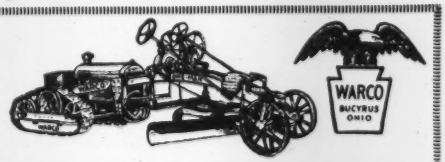

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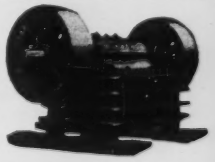

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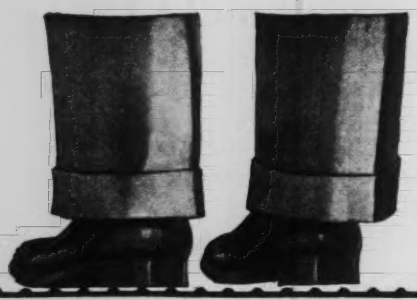

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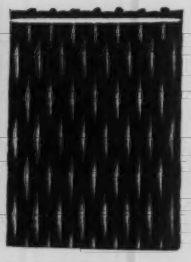

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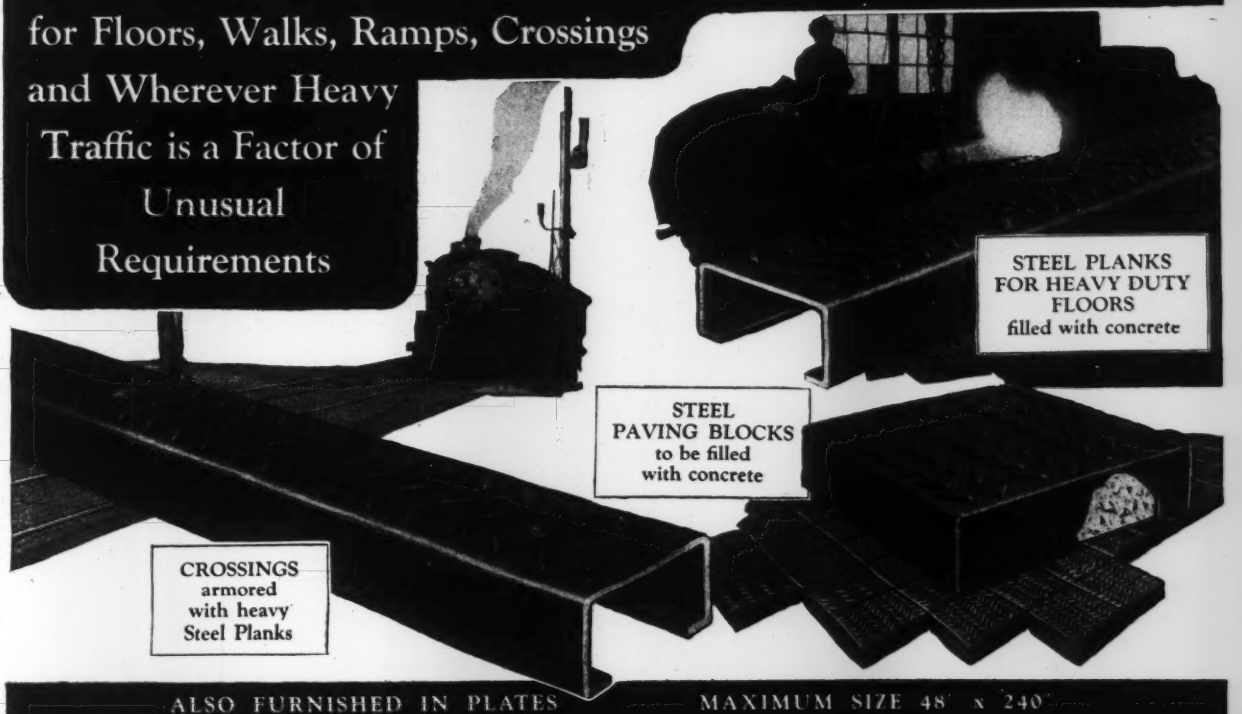
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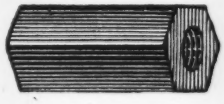

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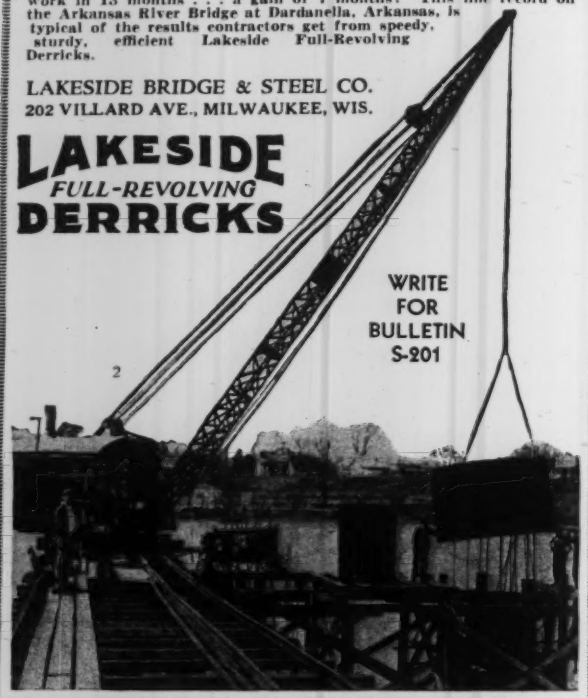

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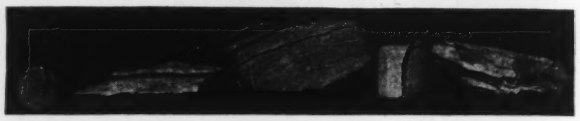

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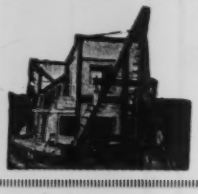

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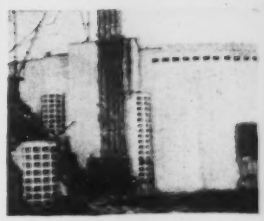

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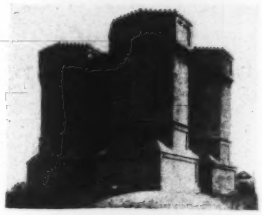

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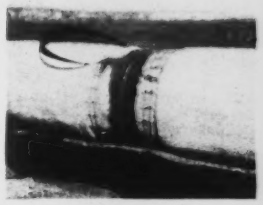

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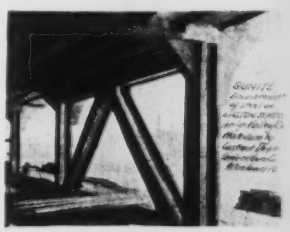

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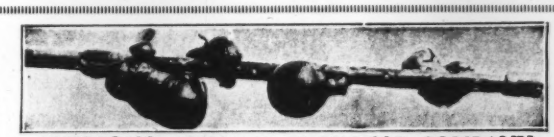

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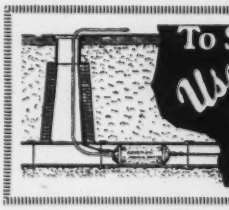
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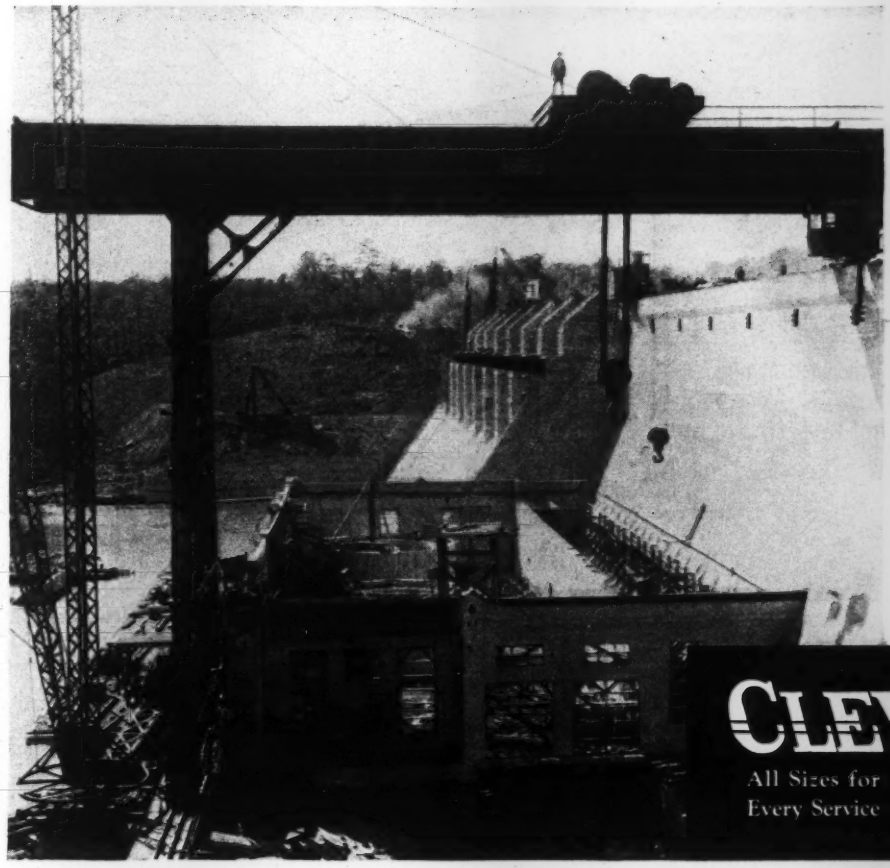

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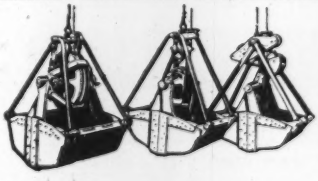

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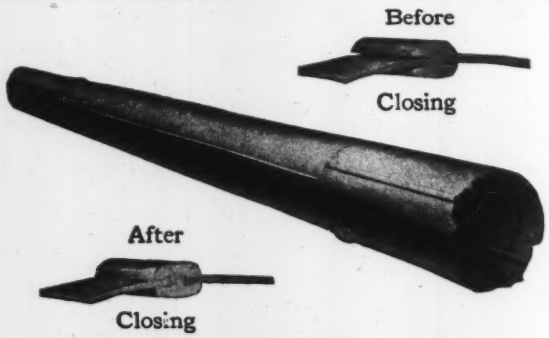

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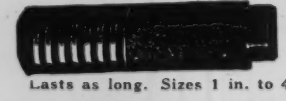

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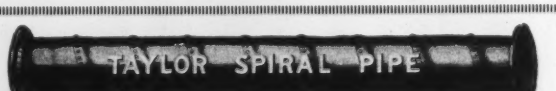

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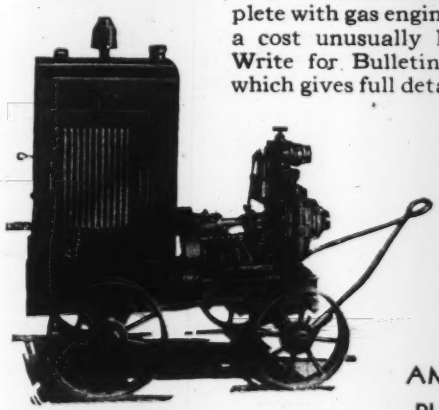

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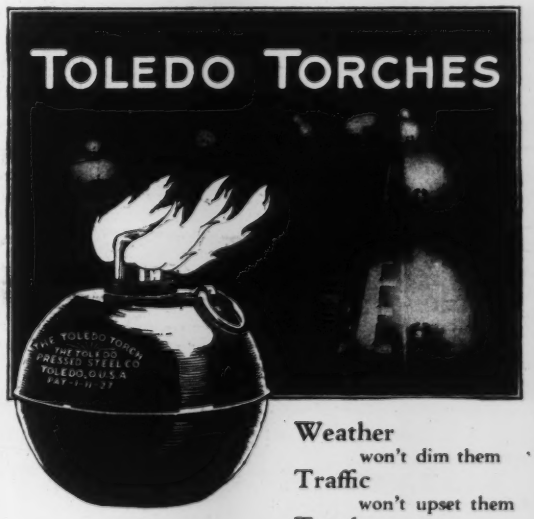

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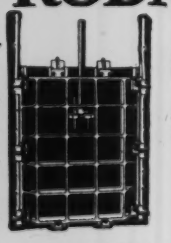

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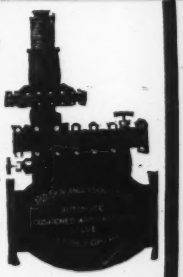

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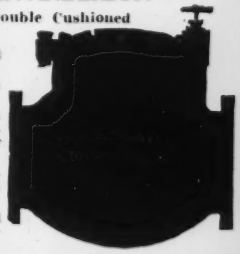

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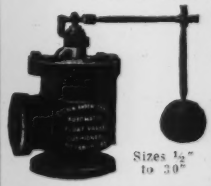

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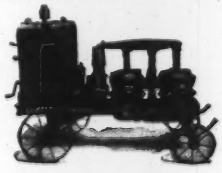

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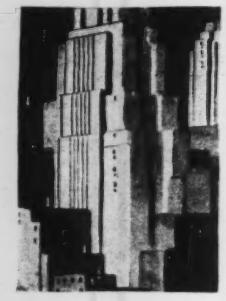

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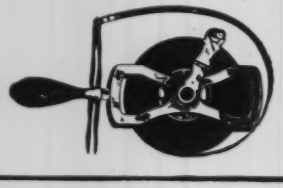

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E. N. R.

U. S. Government

PROPOSALS FOR CONSTRUCTION OF MADDEN DAM.—Sealed bids (Specifications No. 2665) will be received by The Panama Canal, Munitions Building, Washington, D. C., until 10:30 o'clock a.m., September 1, 1931, and then publicly opened, for furnishing labor and materials and performing all work for the construction of the Madden Dam, Power Plant and appurtenant works, which are located on the Chagres River in the Canal Zone. The principal items of work and the estimated quantities involved are as follows: 685,000 cubic yards of all classes of excavation; 646,000 cubic yards of earth and rock fills in embankments; 518,000 cubic yards of concrete, 38,000 cubic feet of grout; drilling 35,000 linear feet of grout holes; placing 3,800,000 pounds of reinforcement bars; installing 719,000 pounds of small metal pipe and fittings; installing 705,000 pounds of large metal conduits; installing 1,487,000 pounds of structural steel; and installing 6,700,000 pounds of gates, hoists and other metal work. This invitation for bids does not cover the purchase of materials which are to be furnished by the Government. Materials to be furnished by the contractor and those furnished by the Government are described in the specifications which will be a part of the contract. For particulars address The Panama Canal, Balboa Heights, Canal Zone, or The Panama Canal, Munitions Building, Washington, D. C. Specifications and plans may be obtained from either of these offices for $2.50, and remittance should be made payable to "The Panama Canal." (2615)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 16, 1931.—Sealed bids, in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., July 7, 1931, for furnishing all labor and materials and performing all work for the construction of the U. S. post Office, etc., at Waynesboro, Ga. The prevailing rate of wage shall be paid all laborers and mechanics employed on the project as provided in the Act of March 3, 1931 (Public No. 798). Drawings and specifications, not exceeding three sets may be obtained at this office in the discretion of the supervising architect by any satisfactory general contractor, and provided a deposit of $15.00 is made for each set to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. Cash deposits will not be accepted. JAS. A. WETMORE, Acting Supervising Architect. (2613)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 15, 1931.—Sealed bids, in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., July 13, 1931, for furnishing all labor and materials and performing all work for the construction of the U. S. post office, etc., at Claremont, N. H. The prevailing rate of wage shall be paid all laborers and mechanics employed on the project as provided in the Act of March 3, 1931 (Public No. 798). Drawings and specifications, not exceeding three sets, may be obtained at this office in the discretion of the supervising architect by any satisfactory general contractor, and provided a deposit of $15.00 is made for each set to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. Cash deposits will not be accepted. JAS. A. WETMORE, Acting Supervising Architect. (2511)

(U. S. Gov. Ads. Cont'd on Page 84)

OFFICIAL PROPOSALS

Bids: July 16.

Calumet Sewage Treatment Works Extension—Division "C"

THE SANITARY DISTRICT OF CHICAGO

Chicago, Ill.

Sealed proposals, endorsed "PROPOSAL FOR CALUMET SEWAGE TREATMENT WORKS EXTENSION, DIVISION C," will be received by the Clerk of The Sanitary District of Chicago at the office of said Sanitary District, Room 600, 910 South Michigan Avenue, Chicago, Illinois, until 10 a.m., Standard Time, on Thursday, July 16, 1931, and will be opened publicly by the Board of Trustees of said Sanitary District at a meeting to be held on that day or at the first meeting thereafter.

The Calumet Sewage Treatment Works Extension is located on both sides of East 126th Street extended, east of the Chicago and Western Indiana Railroad and west of the Michigan Central Railroad and Cottage Grove Avenue and north of 130th Street, in the City of Chicago, County of Cook, State of Illinois.

The work in general for which tenders are invited consists of building an electrically operated pump and blower house including a reinforced concrete substructure with formed water ways, and a structural steel and masonry superstructure. The building is approximately 116 feet wide by 276 feet long with the lower portion of the substructure approximately 40 feet below grade and the superstructure extending approximately 40 feet above grade. Work consists of excavation, back-filling, placing reinforced concrete, furnishing and erection of structural steel, masonry and brick work, installing major equipment consisting of large blowers and pumps furnished by the Sanitary District, and the furnishing, delivering and installing of electrical controlling and switching apparatus, all plant auxiliary machinery and apparatus including air handling equipment, air compressors, vacuum pumps, heating and ventilating systems, general station pipe work and all other work collateral thereto to make a complete sewage pumping and low pressure blower plant ready for operation.

All bids must be made upon blank forms of proposal furnished by the Sanitary District and shall be made in accordance with and to conform to the terms and conditions set forth in "Requirements for Bidding and Instructions to Bidders" attached thereto.

Specifications, form of proposal and a complete set of plans (approximately 255 drawings) may be obtained at said office of said Sanitary District upon payment of the sum of Fifty Dollars ($50.00) for each complete set; said sum so paid to become the property of the Sanitary District except where a bona-fide bid is submitted on the work in which case said payment will be refunded to the bidder.

Said plans and specifications are on file in said office, open for the inspection of prospective bidders, who desire an opportunity to see the nature of the work before paying for plans. Parties requesting portions of the complete set of plans will be charged on a pro rata basis.

Each proposal must be accompanied by a cashier's check on a responsible bank doing business in the City of Chicago, to the amount of Two Hundred Thousand Dollars ($200,000.00) payable to the order of the Clerk of The Sanitary District of Chicago.

The Board of Trustees of The Sanitary District of Chicago reserves the right to reject any or all proposals.

THE SANITARY DISTRICT OF CHICAGO.
By ROSS A. WOODHULL,
Chairman of Its Committee on Finance.

ATTEST:
JAMES J. SULLIVAN, Clerk.
Chicago, June 25, 1931.

OFFICIAL PROPOSALS

Bids: July 15.

Building Section B, Traffic Tunnel

TRANSIT DEPARTMENT

City of Boston, Mass.

The Transit Department of the City of Boston, 1 Beacon Street, seventh floor, invites proposals from citizens of the United States and corporations or other legal associations wherein the controlling interest to the extent of at least over one-half thereof is owned by a citizen or citizens of the United States, for building Section B, Traffic Tunnel. The work consists of the construction of a steel and concrete underground tube about 435 feet long with necessary pipe changes, underpinning, walls and other adjuncts and appurtenances. The method of construction will be generally by open cut. A bond of an approved surety company will be required for the faithful performance of the contract in a sum of 65 per cent of the total bid price. Proposals must be filled out and signed by the bidder on forms to be obtained at this office, inclosed in a sealed envelope, indorsed "Proposal for Building Section B, Traffic Tunnel," and delivered to the Department or to its secretary before 12 o'clock noon on Wednesday, July 15, 1931, at which time and place they will be publicly opened and read. A properly certified check in the sum of fifty thousand ($50,000) dollars, payable to the city, must accompany the proposal. This check shall become the property of the city if the contract is not executed by the bidder within the time prescribed after the date of the notification by the Department of the acceptance of the proposal and the readiness of the contract for signature. Proposals must be made in duplicate. The sealed duplicate, without check, is to be deposited by the bidder with the City Auditor, Room 20, City Hall, previous to the time named for opening the proposals. Plans, proposals, specifications and forms of contract may be obtained at this office on and after Monday, June 22, 1931. A deposit of $25, in cash or by certified check, will be required for a set of plans and two sets of the specifications. Mutilation of them will be deemed sufficient cause for the forfeiture of said deposit. The Department reserves the right to reject any or all proposals.

CITY OF BOSTON TRANSIT DEPARTMENT.
THOMAS F. SULLIVAN, Chairman.
NATHAN A. HELLER, Commissioner.
ARTHUR B. CORBETT, Commissioner.
ERNEST R. SPRINGER, Chief Engineer.
EDWARD F. CONDON, Secretary.

Bids: July 1.

Paving

Easton, Md.

Sealed proposals will be received by the Mayor and Council of Easton, at their office in Easton, Maryland at 2:30 p.m. Wednesdary, July 1, 1931, for paving with concrete approximately fifteen hundred yards (1,500 sq.yds.) of roadway on South Street, in the Town of Easton, Maryland.

Contract, specifications, plans and blank proposals may be obtained from the Town Engineer upon payment of Two Dollars ($2.00).

A certified check in the sum of Two Hundred Fifty Dollars ($250.00) must accompany each bid.

The Mayor and Council reserve the right to reject any or all bids.

RALPH A. TOWNSEND,
Town Clerk
E. G. KASTENHUBER, JR.
Town Engineer.

OFFICIAL PROPOSALS

Bids: July 16.

Sewage Treatment Plant and Appurtenant Structures

TO BE BUILT IN ELIZABETH, NEW JERSEY
DIVISIONS A, B, C AND D OF CONTRACT "D"

Sealed proposals will be received by the Joint Meeting for the construction of a Sewage Treatment Plant and Appurtenant Structures, for the following municipalities:

City of East Orange, Township of Hillside, Town of Irvington, Township of Maplewood, Township of Millburn, City of Newark, Borough of Roselle Park, Village of South Orange, City of Summit, Township of Union and Town of West Orange, N. J.

Said proposals will be received in the Council Chamber, City Hall, Newark, N. J., at 1:00 p.m. (Eastern Standard Time) on Thursday, July 16, 1931, at which time they will be publicly opened and read.

The work involved in Divisions A, B, C and D of Contract "D" is as follows:

DIVISION "A." For constructing Trunk Sewer Crossing under the Elizabethport-Perth Amboy Branch of the Central Railroad of New Jersey together with an adjacent sewer connecting Contract "A" with the Sewage Treatment Plant.

DIVISION "B." For constructing the portion of the Outfall Sewer between Outlet of Treatment Plant Venturi Meters and South Line of South Front Street.

DIVISION "C." For constructing Sewage Treatment Plant and Piping, exclusive of Miscellaneous Equipment, Superstructures, Sludge Storage Works, Electrical Work, Heating and Plumbing.

DIVISION "D." For furnishing and installing Miscellaneous Equipment consisting mainly of Pumps, Ejectors, Compressors, Traveling Cranes, Meters, Valves and Sluice Gates.

In total, the work in Divisions A to D inclusive, involves approximately 70,000 cubic yards of excavation, 14,500 cubic yards of concrete, together with various appurtenances, in all comprising a Sewage Treatment Plant having a settling tank capacity of 50 million gallons daily and a maximum capacity of 172.5 millions gallons daily for all other pertinent structures.

The work is located in Elizabeth, New Jersey, in the area bounded by the Elizabethport-Perth Amboy branch of the Central Railroad of New Jersey, Arthur Kill, the Goethals Bridge and the Elizabeth River.

No bids will be received unless made in writing on blanks furnished and accompanied by a certified check for an amount not less than twelve and one-half (12½) per cent of the amount of the bid made payable to the Treasurer of the Joint Meeting.

Bidders are notified that under Chapter 180 of the Laws of 1926, State of New Jersey, they will be required to furnish a standard form of questionnaire and financial statement containing a complete statement of the bidder's ability, financial standing and experience in performing public work, before such bidder can be supplied with plans and specifications. Bidders may submit a statement of experience in performing private work if no public work has been performed. The Joint Meeting, through its engineer, may refuse to furnish such bidder whose statement is unsatisfactory, with plans and specifications. Blank forms of the questionnaire can be obtained at the office of the engineer, or at the office of the Secretary of the Joint Meeting.

The Joint Meeting reserves the right to reject any or all proposals and to accept that one which in its judgment best serves the interests of the contracting municipalities.

Plans, profiles and specifications may be seen at the office of Edward S. Rankin, Secretary, City Hall, Newark, New Jersey, and seen or procured at the office of Alexander Potter, Chief Engineer, 50 Church Street, New York City, unless refused because the questionnaire and financial statement is unsatisfactory, upon payment of Fifty ($50) Dollars, which amount will be refunded only to Contractors submitting bona fide proposals, who return the plans and specifications in good order within ten days after opening of bids.

By order of the Joint Meeting.
SIMEON H. ROLLINSON,
Permanent Chairman.
EDWARD S. RANKIN,
Secretary.
ALEXANDER POTTER,
Chief Engineer.

OFFICIAL PROPOSALS

Bids: July 7.

Improvement of Highways

STATE DEPARTMENT OF PUBLIC WORKS—DIVISION OF HIGHWAYS
ALBANY, N. Y.

Sealed proposals will be received by the undersigned at the State Office Building, 13th Floor, Albany, N. Y., until one o'clock p.m., advanced standard time which is twelve o'clock noon eastern standard time on Tuesday, July 7, 1931, for the improvement of highways in the following counties:

County	Deposit Required
COLUMBIA (One highway: 8.01 miles)	$24,000.00
LIVINGSTON (One highway: 0.18 mile—Elimination)	3,000.00
SCHUYLER (One highway: 1.64 miles)	6,000.00
SCHUYLER & YATES (One highway: 10.43 miles)	35,000.00
NASSAU (One highway: 0.98 mile)	1,700.00
Also for the reconstruction of the following highways:	
ALBANY (One contract: 2.25 miles)	6,000.00
ERIE (One contract: 5.79 miles)	26,000.00
SCHUYLER (One contract: 6.38 miles)	17,000.00
ST. LAWRENCE (Bridge contract: 0.19 mile)	3,000.00
SUFFOLK (One contract: 1.71 miles)	7,000.00
TOMPKINS (Bridge contract: 0.90 mile)	6,000.00
WESTCHESTER (One contract: 0.45 mile)	6,000.00

Maps, plans, specifications and estimates may be seen and proposal forms obtained at the office of the Department in Albany, N. Y., and also at the offices of the District Engineers in whose districts the roads are located. The addresses of the District Engineers and the counties in each district will be furnished upon request.

The especial attention of bidders is called to "General Information for Bidders" in the itemized proposal, specifications, and contract agreement.

A. W. BRANDT,
Commissioner of Highways.

Bids: July 1.

Construction, Heating, Etc.

Specs. Nos. 6374, 6375, 6376, 6377
Middletown, N. Y.

Separate sealed proposals covering Construction, Heating, Sanitary and Electric Work for Reconstruction of Old Main Bldgs. and Additional Patient and Employee Accommodations, Middletown State Homeopathic Hospital, Middletown, N. Y., in accordance with Specifications Nos. 6374, 6375, 6376, 6377 and accompanying drawings, will be received by the Commissioner of Mental Hygiene, State Office Bldg., Albany, N. Y., until 1 o'clock p.m. (Eastern Standard Time) on Wednesday, July 1, 1931. Proposals shall be accompanied by a certified check or money deposit for 5% of the amount of the bid. Successful bidders will be required to give a bond in the sum of 50% of the amount of the contract. Drawings and specifications may be examined free of charge at the following offices:

Commissioner of Architecture, 80 Centre St., 8th Floor, State Office Building, New York City.
Commissioner of Architecture, 11th Floor, State Office Building, Albany, N. Y.
District Engineer, 109 N. Genesee St., Utica, N. Y.
District Engineer, Weighlock Building, Syracuse, N. Y.
District Engineer, Barge Canal Terminal, Rochester, N. Y.
District Engineer, Barge Canal Terminal, Buffalo, N. Y.
District Engineer, 71 Frederick St., Binghamton, N. Y.
Middletown State Homeopathic Hospital, Middletown, N. Y.

Proposal blanks and envelopes may be obtained and drawings and specifications may be purchased from the Commissioner of Architecture, 11th Floor, State Office Building, Albany, N. Y., upon a payment of $10.00 for each set of Construction Specifications and drawings, $5.00 for each set of Heating Specifications and drawings and $2.50 for each set of Sanitary or Electric Specifications and drawings.

There will be no return of the money paid for such drawings and specifications.
DATED: June 3, 1931.

U. S. Government

(U. S. Gov. Ads contd. from page 93)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 12, 1931.—Sealed bids, in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., July 6, 1931, for furnishing all labor and materials and performing all work for the construction of the U. S. post office, etc., at Rossville, Ga. The prevailing rate of wage shall be paid all laborers and mechanics employed on the project as provided in the Act of March 3, 1931 (Public No. 798). Drawings and specifications, not exceeding three sets, may be obtained at this office in the discretion of the supervising architect by any satisfactory general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. Cash deposits will not be accepted. JAS. A. WETMORE, Acting Supervising Architect. (257)

OFFICE OF THE CONSTRUCTING QUARTERMASTER, Maxwell Field, Montgomery, Alabama. Sealed proposals will be received here until 10:00 a.m., C.S.T., July 7, 1931, and then opened for furnishing and installing an underground gasoline fueling system for airplanes at Maxwell Field, Alabama. Plans and specifications may be obtained from this office by deposit of $10.00. (249)

U. S. ENGINEER OFFICE, NORFOLK, VA.—Sealed bids, in duplicate, will be received until 3:00 p.m., June 30, 1931, and then publicly opened, for furnishing all labor and materials and performing all work for removing about 59,585 cubic yards of material in maintenance dredging in James River at Richmond, Va. Further information on application. (232)

U. S. ENGR. OFFICE, 13th Floor, Customhouse, Boston, Mass.—Sealed bids will be received here until 12 M., daylight saving time, June 30, 1931, and then opened, for riprapping banks of Cape Cod Canal, Mass. Further information on application. (237)

OFFICE OF THE CONSTRUCTING QUARTERMASTER, Maxwell Field, Montgomery, Alabama.—Sealed proposals will be received here until 10:00 a.m., C.S.T., July 14, 1931, and then opened for the construction of Roads, Drains, Sanitary Sewers and Water Mains at Maxwell Field, Alabama. Plans and specifications may be obtained from this office by deposit of $10.00. (254)

U. S. ENGINEER Office, 428 Customhouse, St. Louis, Mo.—Sealed bids, in duplicate, will be received until 11 a.m., July 8, 1931, and then opened, for furnishing all labor, plant and materials and performing all work for placing about 157,000 cubic yards of earthwork in reconstructing and enlarging the levee of the Crane Creek Drainage and Levee District, Schuyler County, Illinois. Plans may be obtained for a deposit of $5.00. Further information on application. (263)

OFFICE OF THE CONSTRUCTING QUARTERMASTER, Fort Monmouth, N. J.—Sealed proposals will be received here until 1:00 p.m., Daylight Saving Time, July 20, 1931, and then opened for furnishing all labor, equipment, material and performing all work for the construction of roads, walks, drains, gas, and water lines, sewers, etc. Plans and specifications will be furnished upon receipt of certified check for $15.00. Plans may be had at this office. (265)

U. S. ENGINEER OFFICE, Detroit, Mich.—Sealed bids in duplicate will be received until 11:00 a.m. Eastern Standard Time, July 7, 1931, for dredging Round Island Shoal No. 1, St. Marys River, Mich. Further information on application. (247)

U. S. ENGR. OFFICE, Providence, R. I.—Sealed bids will be received here until 2 p.m., DST, July 3, 1931, for removing approximately 830 cu.yds. of rock in Providence Harbor, R. I. (2313)

PROPOSALS FOR HEATING PLANT FOR BARRACKS.—Office of Constructing Quartermaster, Fort Monroe, Virginia.—Sealed proposals will be received here until 11 a.m., July 14, 1931, and then opened, for Heating Plant for Barracks at Langley Field, Virginia. Fifteen Dollar deposit check payable United States Treasurer required for plans and specifications. Further information on application. (2514)

(U. S. Gov. Ads cont'd on opposite page)

U. S. Government

(U. S. Gov. Ads. cont'd from opposite page)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 17, 1931.—Sealed bids, in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., July 8, 1931, for furnishing all labor and materials and performing all work for the construction of the U. S. post office, etc., at Manassas, Va. The prevailing rate of wage shall be paid all laborers and mechanics employed on the project as provided in the Act of March 3, 1931 (Public No. 798). Drawings and specifications, not exceeding three sets, may be obtained at this office in the discretion of the supervising architect by any satisfactory general contractor, and provided a deposit of $15.00 is made for each set to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. Cash deposits will not be accepted. JAS. A. WETMORE, Acting Supervising Architect. (262)

WAR DEPARTMENT, Office Constructing Quartermaster, Selfridge Field, Michigan.—Sealed proposals will be received at this office until 1:30 p.m., July 7, 1931, and then opened, for the construction of four hangars and three shops, in accordance with plans and specifications, copy of which may be had at this office upon deposit of $25. (261)

WAR DEPARTMENT, United States Engineer Office, Galveston, Texas.—Sealed proposals will be received here until 12 M, July 17, 1931, and then opened, for dredging in the Houston Ship Channel, Texas, as follows: Widening the channel through Morgan Point to 250 feet, widening the channel from Morgan Point to a point 1,000 feet above Baytown to average width of 200 feet; easing the bends at Lynchburg, Norsworthy, Manchester and Harrisburg. Total cubic yards to be removed approximately 4,740,300. Further information on application. (2510)

GEORGE ROGERS CLARK SESQUICENTENNIAL COMMISSION, office of the architects, F. C. Hirons and F. W. Mellor, 10 E. 49th St., New York City, June 11, 1931—Revised plans and specifications for the George Rogers Clark Memorial, monumental building of approximately 600,000 cubic feet, to be erected at Vincennes, Indiana, and revised requirements for bids have been issued at this office and can be obtained in exchange for those hitherto issued or by payment of $10. The opening of bids has been postponed till 11 a.m. Central Standard Time, July 9, 1931. C. B. COLEMAN, Executive Secretary. (256)

OFFICE OF THE CONSTRUCTING QUARTERMASTER, Fort Benning, Georgia.—Sealed bids in triplicate, for the construction of a Medical Detachment Barracks at this station, will be received at this office until 10 a.m., July 9, 1931, and then publicly opened. The Government reserves the right to accept or reject any or all bids. (252)

PROPOSALS FOR N.C.O. SERVICE CLUB—Office of Constructing Quartermaster, Fort Monroe, Virginia.—Sealed proposals will be received here until 11 a.m., July 15, 1931, and then opened, for Construction of Service Club for Non-commissioned Officers at Langley Field, Virginia. Fifteen Dollar deposit check payable United States Treasurer required for plans and specifications. Further information on application. (2513)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 19, 1931.—Sealed bids, in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., July 20, 1931, for furnishing all labor and materials and performing all work for the construction of the U. S. post office at Murray, Ky. The prevailing rate of wage shall be paid all laborers and mechanics employed on the project as provided in the Act of March 3, 1931 (Public No. 798). Drawings and specifications, not exceeding three sets, may be obtained at this office in the discretion of the supervising architect by any satisfactory general contractor, and provided a deposit of $15.00 is made for each set to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. Cash deposits will not be accepted. JAS. A. WETMORE, Acting Supervising Architect. (264)

(U. S. Gov. Ads contd. on page 86)

OFFICIAL PROPOSALS

Bids: June 30.

State Highway Work

DEPARTMENT OF PUBLIC WORKS
STATE OF MARYLAND
STATE ROADS COMMISSION

Baltimore, Md.

Sealed proposals for building four sections of State Highway as follows:

BALTIMORE CITY, Contract No. BC-106-74—One section of State Highway along Walther Avenue from Southern Avenue to Hamilton Avenue, a distance of 0.58 mile (Sheet Asphalt).

CALVERT COUNTY, Contract No. C-46-84—One section of State Highway along the Coster Road from Frazier toward the Patuxent River, a distance of 1.0 mile and from Solomon's Island Road toward Dowells, a distance of 1.50 miles, total 2.50 miles (Gravel).

CALVERT COUNTY, Contract No. C-48-84—One section of State Highway from the State Road at Stokely to Weems Corner, a distance of 2.08 miles (Gravel).

CAROLINE COUNTY, Contract No. Co-70-22, Federal Aid Project No. 238 and 218-B—One section of State Highway along the Andersontown-Hickman Road from the end of contract No. Co-58 to the Delaware State Line at Hickman, a distance of 2.11 miles and along the Andersontown-Woodenhawk Road from the end of contract No. Co-58 to the Delaware State Line, a distance of 2.72 miles, total 4.83 miles (Concrete).

will be received by the State Roads Commission at its offices, Federal Reserve Bank Building, Calvert and Lexington Sts., Baltimore, Maryland, until 12 M. on the 30th day of June, 1931, at which time and place they will be publicly opened and read.

Bids must be made upon the blank proposal form which, with specifications and plans will be furnished by the Commission upon application and cash payment of $1.00, as hereafter no charges will be permitted.

No bids will be received unless accompanied by a certified check, payable to the State Roads Commission of Maryland, as required by Sec. 6, Chapter 539, Acts of 1931, of the amount as set forth in the proposal form.

The successful bidder will be required to give bond, and comply with the Acts of the General Assembly of Maryland, respecting contracts.

The Commission reserves the right to reject any and all bids.

By order of the State Roads Commission this 16th day of June, 1931.

G. CLINTON UHL, Chairman.
L. H. STEUART, Secretary.

Bids: July 7.

Timber Bridge Construction

STATE OF ILLINOIS
DEPARTMENT OF PURCHASES AND CONSTRUCTION—DIVISION OF WATERWAYS

Springfield, Ill., May 29, 1931.

1. Sealed proposals for a temporary highway bridge at Van Buren Street over the Illinois Waterway, now under construction, in the City of Joliet, Illinois, will be received at the office of the Department of Purchases and Construction, Division of Waterways, State House, Springfield, Illinois, until 9:30 o'clock a.m., Central Standard time, on the 7th day of July, 1931, and there publicly opened and read.

2. The principal items of the contract are approximately as follows:

Concrete	325 Cu.Yds.
Timber	173 M. ft. B. M.
Structural Steel	48,000 lbs.

3. Copies of plans, specifications, and all official forms may be obtained at the office of the Department, Room 1510, 220 So. State St., Chicago, Illinois, upon depositing a check for five dollars ($5.00), made payable to the Director of the Department of Purchases and Construction, which sum will be returned only to bidders who submit bona fide bids for the work, upon the return of the plans and specifications.

4. Alternative bids, based on designs prepared by the bidder will be given consideration if accompanied by drawings showing satisfactory compliance with the State's specifications for Design.

5. The State reserves the right to reject any or all bids. The contract, if let, will be awarded to the lowest responsible bidder.

HENRY H. KOHN, Director,
Department of Purchases and Construction.
BENJAMIN H. MILLER, Supervisor.
Illinois Waterway Construction.
L. D. CORNISH,
Chief Engineer.

OFFICIAL PROPOSALS

Bids: July 6.

State Highway Work

STATE OF NEW JERSEY
STATE HIGHWAY COMMISSION
TRENTON, N. J.

Notice is hereby given that sealed bids will be received by the State Highway Commission of New Jersey for:

ROUTE NO. 10, SECTION NO. 2

Construction of Route No. 10, Section No. 2, Passaic River to Roosevelt Avenue, Morris & Essex Counties. Length 1.164 miles.

Estimated:

30,602 cu.yds. earth excavation.
500 cu.yds. rock excavation.
25,115 cu.yds. borrow.
32,990 sq.yds. 9" rein. concrete pavement.
404 sq.yds. 18" rein. conc. bridge approach.
1,498 sq.yds. 7" penetration macadam.
1,156 sq.yds. FA-BC-1 or Type "A"
1—104' span bridge over Passaic River.
1—82' span bridge over Whippany River.
1 small span stream bridge.

Bids for the above will be received at the office of the New Jersey State Highway Commission, State House Annex, Trenton, New Jersey, on Monday, July 6, 1931, at 11:00 a.m. Eastern Standard Time (Twelve o'clock Noon, Daylight Saving Time) and will be opened and read immediately thereafter.

Drawings, specifications and form of bid, contract and bond for the proposed work are on file at the office of the State Highway Department, Trenton, New Jersey, and may be inspected by prospective bidders during office hours. Plans will be furnished on a deposit of Ten Dollars ($10.00) for each project upon application to the State Highway Department, Room 102, State House Annex, Trenton, New Jersey. Bids must be made on the standard proposal forms in the manner designated in the 1931 standard State Highway specifications and 1926 standard Bridge specifications, and must be enclosed in sealed special addressed envelopes bearing the name and address of the bidder and work bid upon on the outside, and must be accompanied by a certified check drawn to the order of the Treasurer of the State of New Jersey for not less than ten per cent (10%) of the amount of the bid, provided that the said certified check shall not be less than $500.00 nor more than $20,000.00 and must be delivered at the above place on or before the hour named. Copies of the standard proposal form and special addressed envelopes will be furnished on application. Bids not enclosed in special addressed envelopes will be considered informal and will not be opened.

Each bidder must also accompany his bid with a Statement of Equipment properly filled out.

By order of the State Highway Commission.

A. LEE GROVER,
Chief Clerk.

Bids: June 30.

Furnishing & Delivering Sluice Gates

CONTRACT 239

New York City.

Sealed bids will be received by the Board of Water Supply, at its offices, eleventh floor, 346 Broadway, New York City, until 10 a.m., Eastern Standard Time, on Tuesday, June 30, 1931, for Contract 239, for furnishing and delivering ten 5-foot by 15-foot and eight 6-foot by 15-foot sluicegates for Uptake and Downtake Chambers No. 2 of City Tunnel No. 2 at the Hill View reservoir, all as set forth in the specifications. At the above place and time the bids will be publicly opened and read. Pamphlets containing information for bidders, forms of bid and contract, specifications, contract drawings, etc., can be obtained at the office of the Secretary at the above address, by depositing the sum of five dollars ($5) in cash or its equivalent for each pamphlet. For further particulars apply to the office of the Chief Engineer at the above address. GEORGE J. GILLESPIE, President, PHILIP F. DONOHUE, WILLIAM F. DELANEY, Commissioners, Board of Water Supply.

BENJ. F. EINBIGLER, Secretary.

OFFICIAL PROPOSALS

Bids: July 8.

Road Construction

Warren County, N. J.

Notice is hereby given that sealed bids will be received by the Board of Chosen Freeholders of the County of Warren for the construction of State Highway Route 8, Section 7, from Woodpecker Point to Hainesburg, in the Township of Knowlton, County of Warren, New Jersey. The estimated quantities of some of the items involved are approximately as follows:

79,621 cu.yds. earth excavation.
4,000 cu.yds. rock excavation.
7,250 cu.yds. borrow.
52,457 sq.yds. 9" reinforced concrete pavement.
1 bridge 43' span.
1 arch bridge 16' span.
1 bridge 12' span.

Bids will be received at the office of the said Board at the Court House, Belvidere, N. J., on

WEDNESDAY, JULY 8, 1931,
at 1 o'clock p.m., E.S.T.
(2:00 o'clock Daylight Saving Time)

and will be opened and read immediately thereafter.

Drawings, specifications and form of bid, contracts and bond for the proposed work, prepared by H. W. Vetter, County Engineer, and approved by the State Highway Commission, have been filed in the office of the said engineer at the Court House, Belvidere, N. J., and of said State Highway Commission, Trenton, N. J., and may be inspected by prospective bidders during business hours. Bidders will be furnished with blue prints of the drawings by the engineer on proper notice and a deposit of $10.00. Bids must be made on the standard proposal forms in the manner designated therein and required by the specifications, must be enclosed in sealed envelopes, bearing the name and address of the bidder and the name of road on the outside, addressed to the Board of Chosen Freeholders of the County of Warren, Belvidere, N. J.

Bids must be accompanied by a statement from a surety company authorized to do business in New Jersey, stating that it will furnish the bidder with a satisfactory bond in the full amount of the contract, in case he is found to be the lowest responsible bidder and is subsequently awarded the contract. Each bidder must accompany his bid with a certified check payable to the order of C. F. Reinhold, County Treasurer, for not less than ten (10) per cent of the amount bid, provided said check shall not be less than $500.00 nor more than $20,000.00. Bids must be delivered at the place and on the hour above named. The standard proposal form, Instructions to Bidders and envelope for bidding will be furnished on application to the engineer.

By order of the Board of Chosen Freeholders of the County of Warren.

HILTON L. BUTLER, Clerk.

Bids: July 6.

Construction of Toll Buildings and Flood Light Towers

Fort Lee, N. J.

Sealed Proposals for the construction of toll buildings and flood light towers in Fort Lee, New Jersey, for the George Washington Bridge over the Hudson River, will be received at the office of the General Manager of the Port Authority until 11 o'clock, Daylight Saving Time, on the morning of Monday, July 6, 1931, and then publicly opened.

The structures are principally of aluminum, granite and steel construction. Two (2) toll booths are located east of and near Hudson Terrace; the other toll buildings, comprising two (2) toll houses and seven (7) toll booths, and the flood light towers, are located in the plaza area of the approach east of Lemoine Avenue.

A more complete description of the Work and full information for bidders is given in the drawings and other contract papers, which may be seen at the office of the

CHIEF ENGINEER,
THE PORT OF NEW YORK AUTHORITY
80-90 EIGHTH AVENUE, NEW YORK CITY

Complete copies of the foregoing papers will be furnished upon deposit of $25.00. The deposit will be remitted if the papers are returned in good condition not later than thirty days after the opening of bids.

THE PORT OF NEW YORK AUTHORITY,
JOHN F. GALVIN, Chairman.

New York, June 25, 1931.

OFFICIAL PROPOSALS

Bids: July 14.

Construction of Highways, Etc.

STATE DEPARTMENT OF PUBLIC WORKS—DIVISION OF HIGHWAYS
ALBANY, N. Y.

Sealed proposals will be received by the undersigned at the State Office Building, 13th Floor, Albany, N. Y., until one o'clock p.m., advanced standard time which is twelve o'clock noon eastern standard time, on Tuesday, July 14, 1931, for the painting of the Congress Street Bridge, Albany and Rensselaer Counties, for which a deposit of $800.00 will be required, and for the construction of a County Store House and County Assistant's Office near Monticello in Sullivan County, and for the construction of highways in the following counties:

	Deposit Required
SCHUYLER (Elimination Work: 0.436 mile)	$6,000.00
ALSO FOR THE reconstruction of the following:	
CHENANGO (Bridge contract: 0.60 mile)	4,000.00
CLINTON (Bridge contract: 0.06 mile)	2,100.00
ERIE (Elimination work 0.22 mile)	4,500.00
FRANKLIN (Bridge contract: 0.51 mile)	3,100.00
LIVINGST (One contract: 0.20 mile)	1,500.00
MONROE (Bridge contract: 0.08 mile)	700.00
ORANGE (Bridge contract: 0.26 mile)	1,200.00
ORLEANS (Bridge contract: 0.04 mile)	1,000.00
SCHOHARIE (Bridge contract: 0.02 mile)	600.00
WAYNE (Bridge contract: 0.07 mile)	2,000.00

Maps, plans, specifications and estimates may be seen and proposal forms obtained at the office of the Department in Albany, N. Y., and also at the office of the District Engineers in whose district the roads are located. The addresses of District Engineers and the counties in each district will be furnished upon request.

The especial attention of bidders is called to "General Information for Bidders" in the itemized proposal, specifications, and contract agreement.

A. W. BRANDT,
Commissioner of Highways.

Bids: July 7.

Constructing Industrial Service Distribution Main

CONTRACT NO. 7
OFFICE OF THE PASSAIC VALLEY WATER COMMISSION,
156 ELLISON ST., PATERSON, N. J.
June 15, 1931.

Sealed proposals for constructing the Industrial Service Distribution Main and appurtenant work will be received at a meeting of the Commission, in the Commission Chambers, 156 Ellison Street, Paterson, New Jersey, at twelve o'clock noon, Eastern Standard Time, on Tuesday, July 7, 1931, and at that time and place will be publicly opened and read.

The work to be done includes the furnishing and laying of either

12,280 ft. of 51" Lock Bar or welded steel plate pipe,
17,850 ft. of 45" Lock Bar or welded steel plate pipe,

or

12,280 ft. of 48" Cylinder Reinforced Concrete Pipe,
17,850 ft. of 42" Cylinder Reinforced Concrete pipe,

together with required appurtenances.

Proposals must be accompanied by a certified check for Twenty Thousand Dollars ($20,000).

Specifications and forms of contract can be obtained from the office of the Commission, or from the office of Fuller and Everett, 25 West 43rd Street, New York City, by depositing $10.00, which will be refunded on receipt of bids, or return of specifications.

The Commission reserves the right to reject any or all bids or to accept any bid deemed advantageous.

JAMES WILSON, President.
PAUL L. TROAST, Secretary.

FRANK A. BARBOUR,
WESTON E. FULLER,
Engineers.

U. S. Government

(U. S. Gov. Ads. Continued From Page 85)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 20, 1931.—Sealed bids in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., July 14, 1931, for furnishing all labor and materials and performing all work for the remodeling and enlarging the U. S. post office at Longview, Texas. The prevailing rate of wage shall be paid all laborers and mechanics employed on the project as provided in the Act of March 3, 1931 (Public No. 798). Drawings and specifications, not exceeding one set, may be obtained from the custodian of the building or at this office in the discretion of the supervising architect. JAS. A. WETMORE, Acting Supervising Architect. (268)

PROPOSALS FOR PHOTOGRAPH LABORATORY.—Office of Constructing Quartermaster, Fort Monroe, Va.—Sealed proposals will be received here until 2 p.m., July 16, 1931, and then opened, for Construction of Photographic Laboratory at Langley Field, Va. Twenty-five Dollars deposit check payable United States Treasurer required for plans and specifications. Further information on application. (2512)

U. S. ENGINEER OFFICE, Norfolk, Va.—Sealed Bids, in duplicate, will be received until 3 p.m., July 21, 1931, and then publicly opened, for furnishing all labor and materials and performing all work for dredging approximately 128,151 cubic yards of material, place measurement, in Scotts Creek, Norfolk Harbor, Va. Further information on application. (2610)

PROPOSALS FOR SIDEWALKS AND ROADS.—Office of Constructing Quartermaster, Fort Monroe, Virginia.—Sealed proposals will be received here until 11 a.m., July 21, 1931, and then opened, for Construction of Sidewalks, Roads and Curbs in N. C. O. Area, Langley Field, Virginia. Ten Dollar deposit check payable United States Treasurer required for plans and specifications. Further information on application. (267)

OFFICE OF THE CONSTRUCTING QUARTERMASTER, Maxwell Field, Montgomery, Alabama.—Sealed proposals will be received here until 10:00 a.m., C.S.T., July 17, 1931, and then opened for the construction of One (1) Three Hundred Thousand (300,000) Gallon Steel Tank on a One Hundred (100) Foot Trestle at Maxwell Field, Alabama. Plans and specifications may be obtained from this office by deposit of $15.00. (2611)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 12, 1931.—Sealed bids, in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., July 22, 1931, for furnishing all labor and materials and performing all work for the construction of the U. S. post office, court house, etc. (except elevator) at Las Vegas, Nev. The prevailing rate of wage shall be paid all laborers and mechanics employed on the project as provided in the Act of March 3, 1931 (Public No. 798). Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the supervising architect by any satisfactory general contractor, and provided a deposit of $25.00 is made for each set to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. Cash deposits will not be accepted. JAS. A. WETMORE, Acting Supervising Architect. (2614)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 20, 1931.—Sealed bids in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., July 13, 1931, for furnishing all labor and materials and performing all work for remodeling and enlarging the U. S. post office at Atlantic, Iowa. The prevailing rate of wage shall be paid all laborers and mechanics employed on the project as provided in the Act of March 3, 1931 (Public No. 798). Drawings and specifications, not exceeding one set, may be obtained by any satisfactory general contractor at this office in the discretion of the supervising architect. JAS. A. WETMORE, Acting Supervising Architect. (266)

(U. S. Gov. Ads continued on opposite page)

U. S. Government

(Government Ads cont'd from opposite page)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 11, 1931—Sealed bids in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., July 7, 1931, for furnishing all labor and materials and performing all work for the construction of the U. S. post office, etc., at Thomson, Ga. The prevailing rate of wage shall be paid all laborers and mechanics employed on the project as provided in the Act of March 3, 1931 (Public No. 798). Drawings and specifications not exceeding three sets may be obtained at this office in the discretion of the supervising architect by any satisfactory general contractor, and provided a deposit of $15.00 is made for each set to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. Cash deposits will not be accepted. JAS. A. WETMORE, Acting Supervising Architect. (255)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 19, 1931.—Sealed bids, in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., July 10, 1931, for furnishing all labor and materials and performing all work for the construction of the U. S. post office, etc., at Prestonsburg, Ky. The prevailing rate of wage shall be paid all laborers and mechanics employed on the project as provided in the Act of March 3, 1931 (Public No. 798). Drawings and specifications, not exceeding three sets, may be obtained at this office in the discretion of the supervising architect by any satisfactory general contractor, and provided a deposit of $15.00 is made for each set to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. Cash deposits will not be accepted. JAS. A. WETMORE, Acting Supervising Architect. (269)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 22, 1931.—Sealed bids, in duplicate, subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., August 3, 1931, for furnishing all labor and materials and performing all work for the construction (except foundations and elevators) of the U. S. public health service building, Washington, D. C. The prevailing rate of wage shall be paid all laborers and mechanics employed on the project as provided in the Act of March 3, 1931 (Public No. 798). Drawings and specifications, not exceeding six sets, may be obtained at this office in the discretion of the supervising architect by any satisfactory general contractor and provided a deposit of $50.00 is made for each set to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. Cash deposits will not be accepted. JAS. A. WETMORE, Acting Supervising Architect. (2612)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 22, 1931.—Sealed bids, in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., July 7, 1931, for furnishing all labor and materials and performing all work for the construction (except elevator and dumbwaiter) of the U. S. post office, etc., at Erie, Pa. The prevailing rate of wage shall be paid all laborers and mechanics employed on the uroject as provided in the Act of March 3, 1931 (Public No. 798). Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the supervising architect by any satisfactory general contractor and provided a deposit of $25 is made for each set to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. Cash deposits will not be accepted. JAS. A. WETMORE, Acting Supervising Architect. (2616)

CONTRACTORS WATCH THIS SECTION
for New Projects
Publish your announcements thru the "Proposal Section" of Engineering News-Record and get their bids.

OFFICIAL PROPOSALS

Bids: July 17.

Stream Control Tunnel

COMMONWEALTH OF MASSACHUSETTS—METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

Boston, Mass.

Sealed proposals will be received at the office of the Metropolitan District Water Supply Commission, 20 Somerset Street, Boston, Massachusetts, until 2:00 p.m., Daylight Saving Time (1 p.m. Eastern Standard Time), Friday, July 17, 1931, for the construction of the stream control works at the main dam of the Swift River Reservoir in the Towns of Belchertown, Enfield and Ware, Massachusetts. The work consists of excavating and lining about 1,100 feet of rock tunnel and one shaft, excavating approach and outlet channels and constructing appurtenant works. The tunnel will be lined with concrete and will generally be of horseshoe type, 30 feet wide with height varying from 28 feet to 38½ feet. Principal estimated quantities are: Tunnel excavation, 45,000 cu.yds.; open-cut excavation, 270,000 cu.yds.; embankment 260,000 cu.yds.; concrete 17,500 cu.yds.; 48-inch conduit 970 linear feet. Each bid for the stream control works must be accompanied by a certified check for $25,000. Bond or other approved security in such amount not to exceed 50 per cent of the amount of the contract as the Commission may determine after the bids are open will be required. Plans may be seen and information obtained from Frank E. Winsor, Chief Engineer of the Commission, and plans, forms of proposal, contract and specifications will, it is expected, be available for distribution on or about June 27, 1931. Samples of materials obtained from borings may be examined at the office of Division Engineer, N. LeRoy Hammond at Enfield, Massachusetts. The Commission reserves the right to reject any or all bids or to accept the proposal deemed best for the Commonwealth.

R. NELSON MOLT, Secretary.

Bids: July 14.

Paving

Baton Rouge, La.

Sealed proposals for the construction of the following Projects will be received by the Louisiana Highway Commission, Room No. 614, Louisiana National Bank Building, Baton Rouge, Louisiana, until 9:45 a.m. on Tuesday, July 14, 1931. Proposals will not be received after this hour. At 10:00 o'clock a.m. of the same day and date they will be publicly opened and read in the Chamber of the House of Representatives in the State Capitol Building:

(BOND) PROJECT NO. 1605—RINGGOLD-EAST & WEST HIGHWAY—Located in Bienville Parish. Routes 13 and 417. Length 3.2 miles. Width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charges for plans, $1.50.

(BOND) PROJECT NO. 1606—ARCADIA-NORTH & SOUTH HIGHWAY—Located in Bienville Parish. Route 12. Length 2.1 miles. Width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charges for plans, $1.50.

(BOND) PROJECT NO. 2506—LOGANSPORT-LONGSTREET HIGHWAY — Located in the De Soto Parish. Route 38. Length 4.7 miles. Width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charges for plans, $1.50.

Beacon Commissary Corporation
We are prepared to contract for the feeding and housing of men anywhere throughout the United States.
22 South Street, N. Y. City

OFFICIAL PROPOSALS

(BOND) PROJECT NO. 2508—MANSFIELD-SODUS HIGHWAY—Located in De Soto Parish. Route 1. Length 3.1 miles. Width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charges for plans, $1.50.

(BOND) PROJECT NO. 5005—CADDO-RED RIVER PARISH LINE-GRAND BAYOU HIGHWAY—Located in Red River Parish. Route 20. Length 11.4 miles. Width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charges for plans, $2.50.

(BOND) PROJECT NO. 5006—HANNAGRAND BAYOU HIGHWAY—Located in Red River Parish. Route 20. Length 11.2 miles. Width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charges for plans, $2.50.

(BOND) PROJECT NO. 5209—SODUS-NORTH & SOUTH HIGHWAY—Located in Sabine Parish. Route 1. Length 3.5 miles. Width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charges for plans, $1.50.

Full information and proposal forms are available at the offices of the Highway Commission at Baton Rouge. Plans and specifications may be inspected there or will be furnished upon payment of amount specified above (not to be refunded).

O. K. ALLEN, Chairman,
Louisiana Highway Commission.
HARRY B. HENDERLITE,
State Highway Engineer.

Bids: July 6.

Furnishing and Erection of Structural Steel

STATE OF NEW JERSEY
STATE HIGHWAY COMMISSION
TRENTON, N. J.

Notice is hereby given that sealed bids will be received by the State Highway Commission of New Jersey for:

ROUTE 25, CONNECTING LINK, SECTIONS 4B-5

Furnishing and erection of Structural Steel, Route 25, Connecting Link, Sections 4B-5, Contract 52, Town of Kearny, County of Hudson. The work involves the manufacture, delivery and erection of steel superstructure for highway viaduct and includes pipe and structural steel railing. The estimated quantities of the items involved are:

11,000 tons Structural Steel.
310 tons Steel Castings.
5,175 lin.ft. structural steel railing.
500 lin.ft. pipe railing.

Bids for the above will be received at the office of the New Jersey State Highway Commission, State House Annex, Trenton, N. J., on Monday, July 6, 1931, at 11:00 a.m. Eastern Standard Time (Twelve o'clock Noon, Daylight Saving Time) and will be opened and read immediately thereafter.

Drawings, specifications and form of bid, contract and bond for the proposesd work are on file in the office of the State Highway Department, Trenton, N. J., and may be inspected by prospective bidders. Plans will be furnished on a deposit of Twenty-five ($25.00) Dollars upon application to the Jersey City Office of the State Highway Department, 921 Bergen Avenue, Jersey City, N. J. Bids must be made on the standard proposal forms in the manner designated in the 1926 standard specifications for State bridges and must be enclosed in sealed special addressed envelopes bearing the name and address of the bidder and work bid upon on the outside, and must be accompanied by a certified check drawn to the order of the Treasurer of the State of New Jersey for not less than ten per cent (10%) of the amount of the bid, provided that the said certified check shall not be less than $500.000 nor more than $20,000.00 and must be delivered at the above place on or before the hour named. Copies of the standard proposal form and special addressed envelopes will be furnished on application. Bids not enclosed in special addressed envelopes will be considered informal and will not be opened. The right is reserved to reject any and all bids.

Each bidder must also accompany his bid with a Statement of Equipment properly filled out.

By order of the State Highway Commission.
A. LEE GROVER,
Chief Clerk.

OFFICIAL PROPOSALS

Bids: July 7.

State Highway Work

COUNTY OF SUSSEX
STATE OF NEW JERSEY

Notice is hereby given that sealed bids will be received by the Board of Chosen Freeholders of the County of Sussex for the improvement under the Reimbursement Plan of the following section of State Highway Route:

ROUTE NO. 31, SECTION NO. 9,
ANDOVER TO NEWTON

Construction of Route No. 31, Section No. 9, from Andover to Newton, in the County of Sussex. Length 3.03 miles.
ESTIMATED:

20,588 cu.yds. earth excavation.
18,379 cu.yds. rock excavation.
33,668 sq.yds. 9" rein. concrete pavement.
1,262 sq.yds. 7" penetration macadam.
468 sq.yds. 18" rein. concrete surface.
4 small span stream bridges.

Bids for the above will be received at the Freeholders' Room, County Administration Building, Newton, New Jersey, on Tuesday, July 7, 1931, at 10:00 a.m., Eastern Standard Time (11:00 a.m. Daylight Saving Time), and will be opened and read immediately thereafter.

Drawings, specifications and form of bid, contract and bond for the proposed work are on file at the office of Mr. Harvey Snook, County Engineer, County Administration Building, Newton, N. J., and at the office of the State Highway Department, Trenton, N. J., and may be inspected by prospective bidders during office hours. Plans will be furnished on a deposit of Ten Dollars ($10.00) for each project upon application to Mr. Harvey Snook, County Engineer, County Administration Building, Newton, N. J. Bids must be made on the standard proposal forms in the manner designated in the 1931 standard State Highway specifications and 1926 standard Bridge specifications, and must be enclosed in sealed special addressed envelopes bearing the name and address of the bidder and work bid upon on the outside, and must be accompanied by a certified check drawn to the order of the County Treasurer of the County of Sussex for not less than ten per cent (10%) of the amount of the bid, provided that the said certified check shall not be less than $500.00 nor more than $20,000.00 and must be delivered at the above place on or before the hour named. Copies of the standard proposal form and special addressed envelopes will be furnished on application. Bids not enclosed in special addressed envelopes will be considered informal and will not be opened.

Each bidder must also accompany his bid with a Statement of Equipment properly filled out.

By order of the Board of Chosen Freeholders of the County of Sussex.
NORMAN B. ANDERSON,
Clerk.

Bids: July 6.

Construction of Ramp Connection, Etc.

STATE OF NEW JERSEY
STATE HIGHWAY COMMISSION
TRENTON, N. J.

Notice is hereby given that sealed bids will be received by the State Highway Commission of New Jersey for:

ROUTE 25, CONNECTING LINK,
SECTION 7-A

Construction of a ramp connection, Route 25, Connecting Link, Section 7-A, Contract 50, City of Newark, County of Essex. The work consists of the construction of embankment, crib walls, abutment and retaining walls, the removal of two existing bridges and regrading and paving of streets. The estimated quantities of some of the principal items involved are:

9,600 cu.yds. of Embankment.
950 cu.yds. of Concrete.
760 cu.yds. concrete cribbing.

Bids for the above will be received at the office of the New Jersey State Highway Commission, State House Annex, Trenton, N. J., on Monday, July 6, 1931, at 11:00 a.m. Eastern Standard Time (Twelve o'clock Noon, Daylight Saving Time) and will be opened and read immediately thereafter. Drawings, specifications and form of bid, contract and bond for the proposed work are on file in the office of the State Highway Department, Trenton, N. J., and may be inspected by prospective bidders. Plans will be furnished on a deposit of Ten ($10.00) Dollars upon application to the Jersey City Office of the State Highway Department, 921 Bergen Avenue, Jersey City, N. J. Bids must be made on the standard proposal forms in the manner designated in the 1926 standard specifications for State bridges and must be enclosed in sealed special addressed envelopes bearing the name and address of the bidder and work bid upon on the outside, and must be accompanied by a certified check drawn to the order of the Treasurer of the State of New Jersey for not less than ten per cent (10%) of the amount of the bid, provided that the said certified check shall not be less than $500.00 nor more than $20,000.00 and must be delivered at the above place on or before the hour named. Copies of the standard proposal form and special addressed envelopes will be furnished on application. Bids not enclosed in special addressed envelopes will be considered informal and will not be opened. The right is reserved to reject any and all bids.

Each bidder must also accompany his bid with a Statement of Equipment properly filled out.

By order of the State Highway Commission.
A. LEE GROVER,
Chief Clerk.

Bids: July 17.

Excavation for Drainage

Birmingham, Ala.

Sealed proposals will be received by the undersigned until ten o'clock a.m., Friday, July 17, 1931, for certain earth and rock excavation which is proposed to be done by the City of Birmingham on Section Two of Valley Creek drainage project (from 7th Street, Southwest, to 18th Street, Southwest).

The approximate principal quantities being as follows: 110,000 cubic yards earth excavation and 37,000 cubic yards rock excavation.

Specifications may be obtained and plans examined at this office. The right is reserved to reject any or all proposals.

A. J. HAWKINS, City Engineer.

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OFFICIAL PROPOSALS

Bids: July 13.

State Highway Work

STATE OF NEW JERSEY
STATE HIGHWAY COMMISSION
TRENTON, N. J.

Notice is hereby given that sealed bids will be received by the State Highway Commission of New Jersey for:

ROUTE NO. 40, SECTION NO. 4

Construction of Route No. 40, Section No. 4, Medford to Red Lion, in the County of Burlington. Length 3.599 miles.

ESTIMATED:

68,746 cu.yds. unclassified excavation.
8,082 cu.yds. wet excavation.
41,708 sq.yds. 8-inch rein. concrete pavement.
447 sq.yds. 18-inch rein. concrete bridge approach slab.
3 small span bridges.
1 cattle pass.

Bids for the above will be received at the office of the New Jersey State Highway Commission, State House Annex, Trenton, New Jersey, on Monday, July 13, 1931, at 11:00 a.m. Eastern Standard Time (Twelve o'clock Noon, Daylight Saving Time) and will be opened and read immediately thereafter.

Drawings, specifications and form of bid, contract and bond for the proposed work are on file at the office of the State Highway Department, Trenton, New Jersey, and may be inspected by prospective bidders during office hours. Plans will be furnished on a deposit of Ten Dollars ($10.00) for each set of plans upon application to the State Highway Department, Room 102, State House Annex, Trenton, New Jersey. Bids must be made on the standard proposal forms in the manner designated in the 1931 standard State Highway specifications and 1926 standard bridge specifications, and must be enclosed in sealed special addressed envelopes bearing the name and address of the bidder and work bid upon on the outside, and must be accompanied by a certified check drawn to the order of the Treasurer of the State of New Jersey for not less than ten per cent (10%) of the amount of the bid, provided that the said certified check shall not be less than $500.00 nor more than $20,000.00 and must be delivered at the above place on or before the hour named. Copies of the standard proposal form and special addressed envelopes will be furnished on application. Bids not enclosed in special addressed envelopes will be considered informal and will not be opened.

Each bidder must also accompany his bid with a Statement of Equipment properly filled out.

By order of the State Highway Commission.

A. LEE GROVER,
Chief Clerk.

Bids: July 6.

Combined Sewer

Saugerties, N. Y.

Sealed proposals will be received by the Board of Trustees of the Village of Saugerties, County of Ulster, New York, at its office in the Municipal Building, Main Street, Saugerties, New York, until 2:00 o'clock p.m., Daylight Saving Time, on the sixth day of July, 1931, at which time and place, they will be publicly opened and read, for the furnishing of labor and materials and for the construction of a twenty-four inch combined sewer in the Village of Saugerties, New York, such twenty-four inch sewer to be about thirteen hundred feet (1,300) in length.

Plans, Specifications, Proposal Blanks, Form of Contract and Bond and information for bidders may be seen at the office of the Clerk of the Board of Trustees, Main Street, Saugerties, New York, and copies of the same may be obtained upon application to J. F. Loughran, Civil Engineer, Kingston, New York, upon a deposit of $25.00 which sum will be refunded if the plans and specifications are returned in good condition within twenty (20) days of bids having been received and acted upon by the Board of Trustees.

A certified check upon a National Bank, State Bank or Trust Company in the sum of ten per centum (10%) of the amount of the bid, made payable to the Village of Saugerties, New York, must accompany the bid, as a guarantee that the contract will be entered into, if awarded.

A bond in the sum of fifty per centum (50%) of the contract price will be required.

The Board of Trustees of the Village of Saugerties reserves the right to reject any or all bids as it may deem to be to the best interest of the Village of Saugerties.

W. HOYT OVERBAGH, Mayor.
CHARLES H. VEDDER, Village Clerk.
Dated, June 22, 1931.

OFFICIAL PROPOSALS

Bids: July 9.

State Highway Work

Dover, Del.

Sealed proposals will be received by the State Highway Department, at its office, Dover, Del., until 2:00 o'clock p.m., Eastern Standard Time, July 9, 1931, and at that place and time publicly opened for contracts involving the following approximate quantities:

CONTRACT 156
PEARSON'S CORNER-MOORE'S CORNER
5.52 MILES

6 Acres Clearing.
5½ Acres Grubbing.
25,000 cu.yds. Excavation.
9,000 cu.yds. Borrow.
5,500 Tons Broken Slag Base Course.
180 cu.yds. Class A Concrete
14,000 lbs. Reinforcement.
800 lin.ft. 15 in. Corr. M. Pipe
130 lin.ft. 15 in. R. C. Pipe.
90 lin.ft. 18 in. R. C. Pipe.
190 lin.ft. 24 in. R. C. Pipe.
100 lin.ft. 30 in. R. C. Pipe.
80 lin.ft. 36 in. R. C. Pipe.
7,000 lin.ft. Wood Shoulder Curb.

CONTRACT 193
PRIMEHOOK NECK ROAD 6.37 MILES

3 Acres Clearing.
3 Acres Grubbing.
18,000 cu.yds. Excavation.
8,500 cu.yds. Borrow.
6,500 Tons Broken Slag Base Course.
200 cu.yds. Class A Concrete.
8,500 lbs. Reinforcement.
18,000 lbs. Structural Steel.
600 lin.ft. 15 in. Corr. M. Pipe.
360 lin.ft. 15 in. R. C. Pipe.
70 lin.ft. 18 in. R. C. Pipe.
70 lin.ft. 24 in. R. C. Pipe.
40 lin.ft. 30 in. R. C. Pipe.
3,000 lin.ft. Wood Shoulder Curb.
1,400 lin.ft. Timber Piling.
3 M ft. BM Sheet Piling.

CONTRACT 196
GRAVEL SURFACING,
NATIONAL GUARD CAMP

800 cu.yds. Borrow.
2,000 cu.yds. Gravel Surfacing.

CONTRACT 197
COTTON PATCH HILLS-INDIAN RIVER INLET 1 MILE

3,000 cu.yds. Excavation.
1,000 cu.yds. Borrow.
2,500 cu.yds. Gravel Surfacing.
80 lin.ft. 16 in. C. I. Pipe.
40 lin.ft. 24 in. C. I. Pipe.

CONTRACT 198
GEORGETOWN SIDEWALKS 1200 FT.

200 cu.yds. Excavation.
6,000 sq.ft. Cement Concrete Sidewalk.
1,000 lbs. Catch Basin and Drop Inlet Castings.
40 lin.ft. 15 in. R. C. Pipe.

Performance of contract shall commence within ten (10) days after execution of the contract and be completed as specified.

In the employment of labor, preference shall be given to residents of the State of Delaware.

Monthly payments will be made for 90 per cent of the construction completed each month.

Bidders must submit proposals upon forms provided by the Department.

Each proposal must be accompanied by a surety bond, certified check, or money to the amount of at least ten (10) per centum of the total amount of the proposal.

The envelope containing the propsal must be marked "Proposal for the construction of State Highway Contract No. . . . . "

The Contract will be awarded or rejected within twenty (20) days from the date of opening proposals.

The right is reserved to reject any or all bids.

Complete sets of plans and specifications may be obtained upon receipt of two dollars ($2.00) for each contract, which amount will not be refunded.

STATE HIGHWAY DEPARTMENT.
Dover, Delaware.

READ THIS TWICE
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SWART ASSOCIATES, INC.
60 Park Place, Newark, N. J.
80 William St., New York

EMPLOYMENT

AND OTHER BUSINESS OPPORTUNITIES

Positions Wanted, 5 cents a word, minimum charge $1.00 an insertion.
Positions Vacant and all other classifications, 10 cents a word, minimum $2.

Box Numbers in care of our New York, Chicago or San Francisco offices count as 10 words in addition to advertising copy.

Replies are forwarded each day as received at each of the offices mentioned without additional charge.

Discount of 10% is allowed if full payment is made in advance for 4 consecutive insertions.

THE ABOVE RATES ARE FOR ADVERTISEMENS SET UNDISPLAYED. FOR DISPLAY RATES SEE "USED EQUIPMENT" HEADING
COPY FOR NEW ADVERTISEMENTS RECEIVED UNTIL MONDAY FOR THURSDAY'S ISSUE. E.N.-R.

POSITION VACANT

SUPERINTENDENT thoroughly familiar with sliding forms for grain elevator construction. Want man capable of taking complete charge. P-451 Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

EMPLOYMENT SERVICE

IF YOU are qualified for position between $2,500 and $25,000 and are receptive to negotiations for new connection, your response to this announcement is invited. The undersigned provides a thoroughly organized service, established twenty-one years ago, to conduct confidential preliminaries, and assist the qualified man in locating the particular position he desires. Not a registration bureau. Retaining fee protected by refund provision, as stipulated in our agreement. Send name and address only for description of service. R. W. Bixby Inc., 272 Main Street, Buffalo, New York.

CONSTRUCTION managers, superintendents, sales managers, sales engineers, auditors, comptrollers, treasurers in and out of construction have for 12 years engaged us. Individual. Confidential. Not employment agency. Jacob Penn, Incorporated, 535 Fifth Avenue, New York. Established 1919.

EMPLOYMENT AGENCIES

AMERICAN Engineers Service, Harrisburg, Pa. Twenty years' experience soliciting appointments for superintendents, power, factory, mill, mine, municipal engineers, designers, draftsmen, instrumentmen, industrial sales and chemists.

CIVIL engineers. The most important New York technical employment agencies use the New York Herald Tribune Want Ad columns to announce their best positions. Bona fide openings, no registration fee. Keep in touch with available positions through the Herald Tribune.

POSITIONS WANTED

Civil Engineers

AMERICAN civil engineer, 13 years' experience in mining, railroad, highway, hydro-electric and general engineering and construction, now employed as construction superintendent by large firm in South America. Speaks Spanish and French. Wishes permanent connections in the United States or two to five year foreign contract. Salary $5,000. Available in October. PW-401, Engineering News-Record, Tenth Ave. at 36th St., New York.

CIVIL engineer prof. engineer license, C. E. degree, 6 years' experience in all phases of construction on some of the largest buildings in New York; also in small contracting. Available July 1. PW-399, Engineering News-Record, Tenth Ave. at 36th St., New York.

CIVIL engineer-surveyor, married, 10 years' municipal, developments, highways, field-office. Salary $40. PW-396, Engineering News-Record, Tenth Ave. at 36th St., New York.

CIVIL engineer desires position with consulting engineer or contractor; age 34, fourteen years highway and municipal surveys and construction. Prefer warm climate. PW-382, Engineering News-Record, Tenth Ave. at 36th St., New York.

Engineering Construction Assistant

An engineer of long experience in general construction (not buildings) would like to engage temporarily or longer with a company needing an assistant in estimating work, bidding, cost keeping or general management.

PW-442, Engineering News-Record
Tenth Ave. at 36th St., New York City

POSITIONS WANTED

CIVIL engineer, experienced on field layout of tracks and terminal facilities for railroads. PW-238, Engineering News-Record, Tenth Ave. at 36th St., New York.

CIVIL ENGINEER, Indiana license, 6 years' experience with consulting engineers on design and construction of sanitary, hydraulic, and structural projects. Desires position in design, drafting, or construction anywhere in U. S. PW-456, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

CIVIL engineer, graduate, 20 years' experience, reports, estimates, designs, construction; municipal, industrial, public utility, hydro-electric development. PW-367, Engineering News-Record, Tenth Ave. at 36th Street, New York.

GRADUATE civil engineering, 7 years' experience on earth dam design and construction. 2 years' experience as resident engineer. Available immediately. PW-450, Engineering News-Record, Tenth Ave. at 36th St., New York.

Draftsmen and Designers

DESIGNER and detailer, 10 years' experience, coal tipples, industrial conveying machinery, chutes, bins and steel structures. PW-406, Engineering News-Record, Tenth Ave. at 36th St., New York.

DRAFTSMAN, designer and estimator, 8 years' experience on steel structures, desires position. Age 31, married. PW-454, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

Bridge and Structural

STRUCTURAL engineer and designer. Assoc. M.A.S.C.E., university graduate, age 30, experience on steel, concrete and timber for bridge and building projects, best references. PW-446, Engineering News-Record, Tenth Ave at 36th St., New York.

STRUCTURAL engineer. Technical graduate, 42, married. Assoc. Mem. A.S.C.E. 15 years' experience, including chief draftsman of important railroad and structural engineer of small fabricating plant. PW-452, Engineering News-Record, Tenth Ave. at 36th St., New York.

POSITIONS WANTED

Estimators

CHIEF estimator, executive, manager, graduate, Christian, 20 years' experience estimating, purchasing, construction, appraising, buildings and general construction. New York or Philadelphia locaiton preferred. PW-438, Engineering News-Record, Tenth Ave. at 36th St., New York.

Surveyors

CHIEF of party, experienced on railroad location; construction and right-of-way surveys. PW-237, Engineering News-Record, Tenth Ave. at 36th St., New York.

CHIEF of party, topographic surveys for railroads and hydro-electric development. PW-242, Engineering News-Record, Tenth Ave. at 36th St., New York.

PARTY chief, right-of-way surveys for transmission and pipe lines. PW-240, Engineering News-Record, Tenth Ave. at 36th St., New York.

Superintendents

CONTRACTOR'S superintendent, 25 years' experience, bridges, foundations, locks, dams and general heavy construction. Expert on pneumatic caisson work. Have successfully and profitably handled many large projects. Any location. PW-368, Engineering News-Record, Tenth Ave. at 36th St., New York.

CONSTRUCTION superintendent, fifteen years' experience on excavation, paving, sidewalks, bridges, sewers, sewage disposal, waterworks. Capable estimator, good organizer, can get production from equipment, economical, hard worker. Reasonable salary. PW-417, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

CONSTRUCTION superintendent, project manager, estimator, purchasing agent, 18 years' experience in the building industry, seeks new connection. PW-447, Engineering News-Record, Tenth Ave. at 36th St., New York.

GENERAL superintendent or superintendent, 25 years' experience handling large contracts, bridges, harbor work, foundations, dams, subways, sewage disposal plants, pipe lines, and all heavy construction. PW-391, Engineering News-Record, Tenth Ave. at 36th St., New York.

To Qualify for Higher Salary

The quality of your work must improve proportionately. Specialized training in up-to-date, practical engineering methods will bring you broader opportunities in an ever-growing engineering field which will never be over-crowded with competent men. The opportunity to get out of the rut, is offered by enrollment in the

WILSON COURSE
in
STRUCTURAL ENGINEERING
(Home Study, By Mail)

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20th YEAR **Wilson Engineering Corporation**
College House Offices, Harvard Square, Cambridge, Mass., U.S.A.

POSITIONS WANTED

GENERAL superintendent, experienced in all types of construction—practical and matured. PW-323, Engineering News-Record, Tenth Ave. at 36th St., New York.

SUPERINTENDENT, general foreman, road building and land development. Broad practical experience and a livewire road contractor's man. Available one week. Anywhere. PW-402, Engineering News-Record, Tenth Ave. at 36th St., New York.

SUPERINTENDENT or carpenter foreman, any type or size building construction. Old in experience. Young mentally and physically. Prefer South again. C. W. H., 711 W. Onondaga St., Syracuse, N. Y.

SUPERINTENDENT, age forty, experienced power plants, buildings, industrial plants, transmission lines, bridges, pipe lines. Reasonable salary. PW-418, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

SUPERINTENDENT, roads and bridges, graduate engineer, fifteen years' experience; now employed near New York where you can see his work. Salary $4,000 a year. PW-428, Engineering News-Record, Tenth Ave. at 36th St., New York.

SUPERINTENDENT, building construction, age 36, graduate civil engineer, licensed in New York, 12 years' field and office experience, costs, quantity surveys, expediting; can handle men; seeks permanent opening with opportunities, New York City or Westchester County preferred. PW-310, Engineering News-Record, Tenth Ave. at 36th St., New York.

SUPERINTENDENT, estimator, twenty years' experience, estimating and outside supervision. Can handle any type or size building. PW-425, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

SUPERINTENDENT, 12 years' experience state, highway, bridges. Best references. PW-455, Engineering News-Record, Tenth Ave. at 36th St., New York.

Miscellaneous

ARCHITECT, registered New York, New Jersey. Experienced designer and renderer, desires position with architect or engineer. PW-448, Engineer News-Record, Tenth Ave at 36th St., New York.

BOOKKEEPER, paymaster, timekeeper, commissary clerk, age 35, married; high school education, Walton Accounting Course; 4 years bookkeeping, 6 years timekeeper railroad, pipe line construction. Handle large force, camps and volume of work. Capable, trustworthy, efficient. Valuable addition any organization. Location immaterial. PW-384, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

CONTRACTOR'S ASSISTANT. A retired contractor and civil engineer would like to engage for season of 1931. A long experience in charge of, also bidding, estimating, costs and planting jobs of general construction (not buildings). Location anywhere. PW-403, Engineering News-Record, Tenth Ave. at 36th St., New York.

POSITIONS WANTED

EXPERIENCED sales engineer, desires line for California or Pacific Coast. Prefer specialty. Commission or salary. Address 839 Sanborn St., Los Angeles, Calif.

FIELD engineer, experienced on location surveys and field work for bridge building and dock construction. PW-241, Engineering News-Record, Tenth Ave. at 36th St., New York.

GRADUATE engineer, 28, single, seven years' hydro-electric, public utility, railroad, industrial, construction. Inspector, instrumentman, draftsman. Reports, estimates. $2,300. Anywhere. PW-435, Engineering News-Record, Tenth Ave. at 36th St., New York.

OSGOOD, Thew Lorain, Keystone. Shovel operator 12 years' experience on road and sewer. Also repair. Locate anywhere. Steady work. PW-453, Engineering News-Record, Tenth Ave. at 36th St., New York.

RESIDENT engineer of construction, experienced on supervision of contract work monthly estimates, etc. PW-239, Engineering News-Record, Tenth Ave. at 36th St., New York.

SHOVEL OPERATOR — Osgood, Thew Lorain, Keystone. 12 years' experience on road and sewer. Also repair. Locate anywhere. Steady work. PW-449, Engineering News-Record, Tenth Ave. at 36th St., New York.

STRUCTURAL steel designer and detailer. 15 years' experience on coal and coke handling plants, steel plants and bridges. College graduate. Knows Russian language, desires position to go to Russia. Address 1340 Methyl St., Pittsburgh, Pa.

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RA-441, Engineering News-Record
Tenth Ave. at 36th St., New York City

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BO-252, Engineering News-Record
Tenth Ave. at 36th St., New York City

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for Engineering News-Record and other McGraw-Hill papers

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Write me concerning your qualifications for this service and your present connection.

A. W. WELCH
Engineering News-Record
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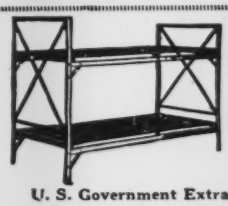

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See Page 96 for For Rent Ads

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WANTED
VULCAN EXTRACTOR
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470 East Market St., Akron, Ohio

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3—Browning 25-ton 8-wheel Locomotive Cranes, 50-ft. booms, good as new.

1—Browning 25-ton, 8-wheel gasoline Locomotive Crane, 50-ft. boom.

2—Northwest Model 105 Crawler Cranes, 40-ft. boom.

1—Browning 15-ton Crawler, 50-ft. boom.

2—Browning 7½-ton **Truck Cranes.**

1—Browning 10-ton Crawler Crane.

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Check **HAISS** As Your Source of **GOOD FACTORY REBUILT EQUIPMENT**

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1—Haiss ¾ yd. "Contractor" Bucket.
1—Haiss ¾ yd. "Hi-Power" Bucket.
1—Haiss 1 yd. "Contractor" Bucket.
1—Haiss 1 yd. "Hi-Power" Bucket.
1—Haiss 2½ yd. "Hi-Power" Bucket.
1—Blaw-Knox ⅜ yd. Dreadnaught Bucket.

Factory Rebuilt Portable Belt Conveyor

1—Haiss 14-in.x25-ft. long Rebuilt Conveyor with gasoline engine.

Factory Rebuilt Truck Loaders

1—Haiss 14-in.x25-ft. long Rebuilt Conveyor with with 41 hp. Waukesha engine.

GEORGE HAISS MFG. CO., INC.

140th St. & Rider Ave., New York City

FOR SALE

2—Model 42A Barber Greene **Bucket Loaders** mounted on full caterpillars overhauled, ready to operate—$1250 each.

1—60-hp. double drum American **Gasoline Dragline Hoist,** like new—$1,450.

1—160-cu.ft. **Gasoline Portable Air Compressor,** A-1 condition—$950.

1—37-hp. double drum American **Electric Hoist** with attached boom swinger, A-1 condition—$1,200.

2—22-hp. 4 cylinder **Gasoline Power Units** with clutch and radiator, brand new—$150 each.

Mertes Machinery Company

1622 So. 1st Street, Milwaukee, Wis.

FOR SALE

ELECTRIC CABLEWAY

1—Mundy, 750 ft. span. Complete with hoist, motor, and carriages. Excellent condition. Available immediately.

FRAZIER-DAVIS CONST. CO.

Arcade Bldg., St. Louis, Mo.

SHOVEL-CRANE

1—General ½-yd. Shovel. Also has Crane attachment, 35-ft. Boom and ½-yd. Owen Bucket. Fine condition.

J. T. WALSH

500 Brisbane Bldg., Buffalo, N. Y.

CRANE

FOR SALE OR RENT

1—16-ton cap. LINK-BELT, Gas Crawler Crane, new 100 hp. Motor 1930, self-starter, new 50-ft. bm., entirely rebuilt March, 1931, like new.

GREY STEEL PRODUCTS COMPANY, INC.

111 Broadway, New York, N. Y.
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20—4-yd. Koppel 36-in. ga., steel un'frame dump.
50—12-yd. Western std. ga. Air Dump Cars.
10—20 cu.yd. K.&J. Standard Gauge Dump.

CRANES—GANTRY

2—15-ton Link-Belt Gantry Cranes, full revolv. with 90-ft. bm., mtd. on 30-ft. towers, st. oper.

CRANES—GASOLINE

1—10-ton McMyler Crawler, 40-ft. boom.
1—15-ton Link-Belt K2, 60-ft. boom.

CRANES—LOCOMOTIVE

1—15-ton Link Belt D.D. 50-ft. bm., new 1923.
1—25-ton, 8-wheel std. ga. Browning, 50-ft. bm.

KEYSTONE GRADER

1—No. 4 Cat Gas Keystone, equip. with skimmer and ditcher at., ⅝ and 9/10-yd. dip, rebuilt.

HOISTING ENGINES

1—80 hp. Lidgerwood, 2-drum, 80 hp. A.C., 440 v., 3 ph., 60 cy. Motor, Controller and Grids.
1—75-hp. National T.D., independent mtr. driven swing, and bank lvr. cont., 3 ph., 60 cy., 440 v.
1—60-hp. National 3-drum with independent swinger, 3 ph., 60 cy., 220 v.
1—60-hp. D.D. Mundy, 4-cyl. Gasoline.
1—15-hp. single Drum Meade Morrison Gasoline.
1—10x12, 3-drum Clyde Skeleton, with Swinger.
1—8¼x10 Triple Dr. Lidgerwood, A.S.M.E. blr.

PUMPS

7—4-in. Suction, 4-in. Discharge Submersible Mtr. Driven Pumps, 15 HP., 3 ph., 60 cy., 220 v. mtrs., cap. 435 GPM at 75-ft. head or 690 GPM free discharge. Complete and brand new.
1—6 and 8-in CH&E Centrif., 4-cyl. gaso. eng.

LOCOMOTIVES—STEAM

1—11x16 Amer. 4-wh. Std. Ga. S.T. New 1926.
2—11x16 Davenport std. ga. Saddle Tank.
1—80-ton American 6-wheel Saddle Tank 0-6-0.

LOCOMOTIVES—GASOLINE

1—6-ton Whitcomb, 24-in. gauge.
2—14-ton Plymouth, 36-in. gauge.
1—30-ton Plymouth, standard gauge.

ROLLERS—GASOLINE

1—10-ton Buffalo-Springfield 3-wh., 4-cyl.
1—10-Ton Huber 3-whl., 4-cyl. with Scarifier.

SHOVELS

2—50B Bucyrus Steam Shovels, new 1929, condition like new.
1—1-yd. Link-Belt Caterpillar Gas., rebuilt.
1—¾-yd. P&H Model 206 Shovel Front, Complete.

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1—Ingersoll-Rand E.R.1, size 12x10, capacity 320 cu.ft., belt connected to 75 hp. squirrel cage induction motor.

1—Chicago Pneumatic, size 9x11, steam driven, Shop No. 8855.

1—Chicago Pneumatic, belt drive, size 10x 12, G.S.B., Shop No. 4760.

2—Buhl Portable, on trucks, brand new. One 160-ft., Shop No. 4724; one 118-ft., 47933.

1—Gardner, Type S.H., belt driven, size 6x6, duplex, Shop No. 7865, with 15 hp. Allis-Chalmers, 220 volt, 60 cycle, 3 phase, alternating current motor.

2—G. E. Centrifugal Air Compressors, direct connected to 120 hp. G.E. 220 volt A.C. motors. Cap. 9000 cu.ft. at 2 lbs. pressure.

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BUCKETS

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1—Owens 1-yd. Type B Clamshell, Shop No. 4622.

1—Blaw-Knox ½-yd. Dreadnaught, size 606, Shop No. B-4613.

CAGES

2—Ottumwa Iron Works, Mine Shaft Cages; one for men and one for freight, equipped with safety dogs.

CARS

20—1½-yd. all-steel, 24-in. gauge, 2-way Dump Cars.

CONCRETE MIXERS

1—Smith, 56-S, 2-yd. Tilting Mixer, Shop No. 46558, with Allis-Chalmers, 40-hp. Type A.R., 440 volt, 60 cycle, 3 phase, A.C. motor.

1—Smith 28-S, non-tilting, Shop No. 48269, with A.C. motor.

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1—Clyde, all-steel Guy Derrick, 130-ft. mast, 120-ft. boom, 20-ft. bull wheel, 10-ton capacity, at maximum radius; with guys.

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1—Chain Belt Rex No. 50, vertical centrifugal discharge, full enclosed bucket elevator, buckets on chain, 40-ft. centers, capacity 50 yds. per hour, with 10 hp., 220 volt, 3 phase, 60 cycle, A.C. motor.

ENGINES

1—Fairbanks Morse, 100 hp., Type "Y", 2-cylinder, Style VA, Diesel engine, with starting equipment.

GROUTERS

1—Union Grout Machine.

HOISTS

1—Clyde 3-drum Hoist, with attached swinger, Shop No. 9191, arranged for belt drive, and direct connected to 100 hp. Fairbanks Morse 2-cylinder Diesel engine.

1—National 100-hp., 3-drum Electric Hoist with attached swinger, Shop No. 1805.

1—Lidgerwood, 60-hp., 3-drum Electric Hoist with 220 volt, 60 cycle, 3 phase, variable speed motor, Shop No. 2735-P, with 7½ hp., separate electric swinger.

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1—Sullivan Turbine Single Drum Air Hoist, Shop No. 2258.

LOCOMOTIVES

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60 other outfits from ½ to 6-yd.

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10—50-ton Capacity All Steel Twin Hopper Cars.

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1—36-in. ga. Nordberg, Shop No. 513.

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2—Model 206 P. & H. Shovels, Cranes or Draglines, ¾-yd. capacity on Caterpillars, Shop Nos. 1764-2198-2299.
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1—20-ton Brown Hoist, Shop No. 8054, 50-ft. Boom.
2—30-ton Ohio Locomotive Crane, 60-ft. Boom; new 1920, Nos. 3952-3953.

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3—Complete Shovel Attachments for K-2 Link-Belt, 1-yd. Dipper.
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20—30-yd. Clark, Steel, Automatic.
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8—20-yd. Western Automatic.
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63—12-yd. Western.
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8—5-yd. 36-in. ga. Western Steel Beam.
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4—4-yd. 36-in. ga. Western Wood Beam.

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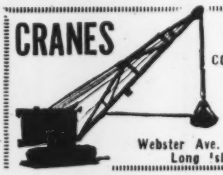

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Bridges, Suspension Cable
American Steel & Wire Co.
Roebling's Sons Co., John A.

Buckets, Clam Shell
Blaw-Knox Co.
Browning Crane & Shovel Co.
Erie Steel Constr. Co.
Haiss Mfg. Co., Geo.
Hayward Co.
Industrial Brownhoist Corp.
Owen Bucket Co.
Williams Co., G. H.

Buckets, Concrete
Ransome Concrete Mchry. Co.

Buckets, Contractors
Owen Bucket Company

Buckets, Dragline
Blaw-Knox Co.
Erie Steel Constr. Co.
Harnischfeger Corp.
Hayward Co.
Novo Engine Company
Williams Co., G. H.

Buckets, Dredging & Excavating
Blaw-Knox Co.
Haiss Mfg. Co., Geo.
Harnischfeger Corp.
Hayward Company
Industrial Brownhoist Corp.
Link-Belt Company
Moretrench Corp.
Owen Bucket Company
Williams Co., G. H.

Buckets, Electric
Hayward Company

Buckets, Elevator
(See Elevators, Buckets)

Buckets, Orange-Peel
Browning Crane & Shovel Co.
Hayward Co.

Buildings, Steel
American Bridge Co.
Belmont Iron Works
Blaw-Knox Co.
Erie Steel Constr. Co.
McClintic-Marshall Corp.
Truscon Steel Company

Cableways
American Steel & Wire Co.
Hayward Co.
Roebling's Sons Co., John A.

Cableways, Excavators
(See Excavators, Cableway)

Carbide
Linde Air Products Co.

Car Steps, Safety
(See Treads, Safety)

Cars, Air Dump, Industrial, Etc.
Koppel Industrial Car & Equip. Co.
Western Wheel-Scraper Co.

Carts, Concrete
Ransome Concrete Mchry. Co.

Castings, Iron and Steel
Central Foundry Co.
Fox & Co., John
Marion Malleable Iron Wks.
Novo Engine Company
Warren Fdry. & Pipe Corp.

Cement
Universal Atlas Cement Co.

Cement Gun
Cement Gun Co., Inc.

Cement Making Machines
Austin Mchy. Corp.

Centers, Steel Collapsible
Blaw-Knox Co.

Central Mixing Plants
Austin Mchry. Corp.
Blaw-Knox Co.
Chain Belt Company
Ransome Conc. Mchry. Co.

Chain, Steel and Malleable Sprocket
Chain Belt Company
Haiss Mfg. Co., Geo.
Link-Belt Company
Ryerson & Son, Joseph T.

Channelers
(See Drills, Rock)

Chemicals
Wallace & Tiernan Co., Inc.

Chimneys, Concrete
Custodis Chimney Const. Co., Alphons
Kellogg Co., M. W.
Rust Engineering Co.
Summerhays Sons, Wm.
Weber Chimney Co.

Chimneys, Radial Brick
American Chimney Corp.
Ballard, Sprague & Co.
Custodis Chimney Const Co., Alphons
Kellogg Co., M. W.
Rust Engineering Co.
Summerhays Sons, Wm.

Chimneys, Steel
Blaw-Knox Co.
Chicago Bridge & Iron Works
McClintic-Marshall Corp.
Pitts.-Des Moines Steel Co

Chlorinators
Wallace & Tiernan Co., Inc.

Chlorine Liquid
Wallace & Tiernan Co., Inc.

Chutes, Concrete
Ransome Concrete Mchry. Co.

Coal and Ore Conveying Machinery
American Bridge Co.
Barber-Greene Co.
Chain Belt Company
Haiss Mfg. Co., Geo.
Link-Belt Company

Coal Storage Systems
Chain Belt Company
Haiss Mfg. Co., Geo.
Link-Belt Company

Compressors, Air, Heavy Duty
Allis-Chalmers Mfg. Co.
Nash Engrg. Co.
Schramm, Inc.
Westinghouse Traction Brake Co.

Compressors, Air Portable
De Vilbiss Company
Domestic Engine & Pump Co.
Nash Engrg. Co.
Novo Engine Company
Schramm, Inc.

Concrete Admixtures
Barnsdall Tripoli Co.
Johns-Manville Corp.

Concrete Breaking
McKiernan-Terry Corp. (Steele & Condit Div.)

Concrete Floor Hardener
Blaw-Knox Company
Truscon Laboratories

Concrete Making Machinery
(See Mixers)

Concrete Proportioning Equipment
Blaw-Knox Co.

Concrete Reinforcement
American Steel & Wire Co.
Carnegie Steel Company
Illinois Steel Company
Jones & Laughlin Steel Corp.
Laclede Steel Co.
Ryerson & Son, Inc., Jos. T.
Truscon Steel Company

Concrete Workability Agents
Johns-Manville Corp.

Contractors
Ambursen Constr. Co.
Cement-Gun Constr. Co.
Gunite Concrete & Constr. Co.
Gunite Construction Co.
National Gunite Contr. Co
Raymond Concrete Pile Co
Spencer, White & Prentis Inc.
Terry & Tench Co., Inc.
White Co., Arthur J.

Conveying Systems
Chain Belt Company
Moretrench Corp.

Conveyors, Belt & Chain
Austin Western Road Machinery Co.
Barber-Greene Co.
Chain Belt Company
Haiss Mfg. Co., Geo.
Industrial Brownhoist Corp.
Link-Belt Company

Conveyors, Bucket
Barber-Greene Co.
Chain Belt Company
Haiss Mfg. Co., Geo.
Industrial Brownhoist Corp.

Copper Bearing
Alan Wood Steel Co.

Cranes, Crawler, Gas, Electric and Diesel
Austin Mchy. Corp.
Buckeye Trac. Ditcher Co.
Harnischfeger Corp.
Ohio Power Shovel Co.
Universal Crane Co.

Cranes, Locomotive
(See also Cranes, Crawler)
Browning Crane & Shovel Co.
Bucyrus-Erie Company
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Motor Truck
Browning Crane & Shovel Co.
Buckeye Tract. Ditch. Co.
Harnischfeger Corp.
Universal Crane Co.

Cranes, Overhead
Cleveland Crane & Engrg. Co.
Erie Steel Constr. Co.
Harnischfeger Corp.
Link-Belt Company
Northwest Engineering Co.

Cranes, Wrecking
Browning Crane & Shovel Co.
Industrial Brownhoist Corp.

Crawler Attachments
Buckeye Trac. Ditcher Co.
Haiss Mfg. Co., Geo.

Crawlers, Rear Type
Riddell Company, W. A.

Creosoted Blocks, Timber Poles, Cross-Arms, Lumber, Etc.
Brown Wood Preserving Co.
Compressed Wood Preserving Co.
Wyckoff Pipe & Creo. Co.

Creosoting
American Creosote Wks.
Brown Wood Preserving Co.
Compressed Wood Preserving Co.
Savannah Creosoting Co.
Wyckoff Pipe & Creo. Co.

Crushers and Pulverizers
Allis-Chalmers Mfg. Co.
Austin-Western Rd. Mchry. Co.
Universal Crusher Co.

Culverts, Corrugated
Gohi Culvert Mfrs., Inc.
Republic Steel Corp.

Culverts, Metal
Gohi Culvert Mfrs., Inc.
Republic Steel Corp.

Dams
Ambursen Construction Co.

Dam Proofing
American Asphalt Grouting Co.
Dravo Contracting Co.

Dealers, Equipment
(See Searchlight Section)

Derricks and Derrick Fittings
Haiss Mfg. Co., Geo.
Harnischfeger Corp.
Hayward Co.
Lakeside Bridge & Steel Co.

Distributors, Pressure Oil
(See Road Oilers, Pressure)

Ditching Machinery
(See Excavators)

Docks and Harbor Work
Raymond Concrete Pile Co.
Snare Corp., Fred'k.

Doors, Shutters, Steel Rolling
Truscon Steel Company

Drafting Room Furniture and Supplies
Dietzgen Co., Eugene
Hamilton Mfg. Co.
Weber Company, Inc.

Draglines
(See Excavators, Dragline)

Drain Pipe
(See Culverts)

Drawing Materials
Dietzgen Co., Eugene
Hamilton Mfg. Co.

Drawing Tables
(See Tables and Boards Drawing)

Dredges
Bay City Shovels, Inc.
Bucyrus-Erie Company
Hayward Co.
Morris Machine Works
Norbom Engineering Co.

Dredges, Dipper
Austin Mchy. Corp.
Bucyrus-Erie Company
Harnischfeger Corp.
Link-Belt Company

Dredging and Excavating
Erie Steel Constr. Co.

Drills, Core
McKiernan Terry Corp.
Sprague & Henwood, Inc.

Drills, Rock
Schramm, Inc.

Drums, Holding and Counterweight
Blaw-Knox Co.
Hayward Co.

Dryers
Blaw-Knox Co.

Dump Bodies, Truck
Athey Truss Wheel Co.

Electrical Wires & Cables
(See Wire & Cable Elec.)

Elevators, Bucket
Chain Belt Company
Haiss Mfg. Co., Geo.
Hendrick Mfg. Company
Industrial Brownhoist Corp.
Link-Belt Company
Ohio Locomotive Crane Co.

Elevators, Contractors' Material
Barber-Greene Co.
Chain Belt Company
Dravo Equipment Co.
Ransome Concrete Mchry. Co.

Engineers
(See also Directory of Engineers)
Raymond Concrete Pile Co.
Spencer, White & Prentis, Inc.
Terry & Tench Co., Inc.

Engineers and Draftmen's Instruments and Supplies
Dietzgen Co., Eugene
Hamilton Mfg. Co.
Weber Company, Inc.

Engines, Gasoline
Allis Chalmers Mfg. Co.
Novo Engine Company

Engines, High Duty Water Works
Morris Machine Works

Engines, Portable
(See Engines, Gasoline)

Excavators, Bucket
Haiss Mfg. Co., Geo.

Excavators, Ditch & Trench
Austin Mchy. Corp.
Barber-Greene Co.
Bay City Shovels, Inc.
Buckeye Tr. Ditcher Co.
Bucyrus-Erie Company
Harnischfeger Corp.
Indust'l Brownhoist Corp.
Link-Belt Company
Moretrench Corp.
Northwest Engineering Co.
Ohio Power Shovel Co.

Excavators, Drag-Line
Austin Mchy. Corp.
Bay City Shovels, Inc.
Blaw-Knox Company
Buckeye Traction Ditcher Co.
Bucyrus-Erie Company
Harnischfeger Corp.
Hayward Co.
Link-Belt Company
Northwest Engineering Co.
Novo Engine Company
Ohio Power Shovel Co.
Universal Crane Co.

Expanded Metal
Ryerson & Son, Inc., Jos. T.

Filters, Water, Municipal & Industrial
Amer. Water Softener Co.
Metropolitan Paving Brick Co.
Roberts Filter Mfg. Co.
Scaife & Sons Co., Wm. B.

Finishing Machines (Road)
(See Road Finishers, Concrete)

Fireproofing Material and Construction
Metropolitan Paving Brick Co.
National Fireproofing Corp.
Truscon Steel Company

Floor Hardener, Concrete
Alan Wood Steel Co.
Blaw-Knox Co.

Floor Plates, Steel
Blaw-Knox Co.
Carnegie Steel Company
Ryerson & Son, Inc., Jos. T.

Flooring, Bridge
Dravo-Doyle Co.

Flooring, Fireproof
Alan Wood Steel Co.
Dravo-Doyle Company
Hendrick Mfg. Company
Kerlow Steel Flooring Co.
Tri-Lok Company

Floor Plates Steel
Alan Wood Steel Co.

Floors, Asphalt Mastic
Standard Oil Co. (Indiana)

Floors, Creosoted Wood
Compressed Wood Preserving Co.

Flumes, Iron and Steel
Blaw-Knox Co.
Gohi Culvert Mfrs., Inc.

Forgings
Carnegie Steel Company

Form Clamps and Tighteners
Marion Malleable Ir. Wks
Universal Form Clamp Co.

Forms—Culvert, Sewer, Tunnel, Etc.
Blaw-Knox Co.

Forms, Curb and Gutter
Blaw-Knox Co.

Forms, Road
Blaw-Knox Co.

Forms for Walls, Building Construction, Etc.
(See Concrete Floor Hardener)

Foundations
Foundation Co.
Raymond Concrete Pile Co
Spencer, White & Prentis, Inc
Underpinning & Foundation Co.

Furnaces, Annealing and Tempering
American Bridge Co.
Timken Roller Bearing Co., The

Gas Holders
McClintic-Marshall Corp.

Gates, Clam Shell
Haiss Mfg. Co., Geo.

Gates, Flood and Sluice
Hunt Mch. Co., Rodney
Republic Steel Corp.

Gates, Hopper
Haiss Mfg. Co., Geo.

Gauges, Loss of Head
Simplex Valve & Meter Co

Gauges, Rate of Flow
Simplex Valve & Meter Co

Gears
De Laval Steam Turbine Co.
Earle Gear & Mach. Co
Haiss Mfg. Co., Geo.

Generators, Acetylene
Linde Air Products Co.

Generators, Electric
Allis-Chalmers Mfg. Co.

Graders, Elevating
Adams Company, J. D.
Austin-Western Rd. Mchry. Co.

Graders, Motor
Adams Company, J. D.
Austin-Western Rd. Mchry. Co.
Riddell Co., W. A.

Graders, Tractor Drawn
Adams Company, J. D.
Austin-Western Rd. Mchry. Co.
Blaw-Knox Co.
Riddell Company, W. A.

Gratings, Flooring & Safety
Blaw-Knox Co.
Dravo-Doyle Company
Hendrick Mfg. Company
Kerlow Steel Flooring Co
Tri-Lok Company

Grills
Dravo-Doyle Company
Tri-Lok Company

Grouting
Amer. Asphalt Grout'g Co
Dravo Contracting Co.

Guard Rail Strand
American Steel & Wire Co.
Hazard Wire Rope Co.

Gunite Construction
Cement-Gun Co., Inc.
Cement-Gun Constr. Co.
Gunite Concrete & Constr. Co.
Gunite Construction Co.
Nat'l Gunite Contr. Co.
Rust Engr. Co.
White Co., Arthur J.

Hammers, Pneumatic
(See Tools, Pneumatic)

Hammers, Steam, Pile
(See Pile Hammers, Steam)

Hangers
American Bridge Co.

Heating Equipment
Buffalo Forge Co.

Highway Crossings
Truscon Steel Company

Hoists, Contractors'—Electric
Allis-Chalmers Mfg. Co.
Bay City Shovels, Inc.
Harnischfeger Corp.
McKiernan-Terry Corp. (Nat'l Hoist Eng. Div.)
Novo Engine Company

Hoists, Contractors'—Gasoline
Domestic Engine & Pump Co.
Harnischfeger Corp.
McKiernan-Terry Corp. (Nat'l Hoist Eng. Div.)

Hoists, Contractors' Steam
Allis-Chalmers Mfg. Co.
McKiernan-Terry Corp. (Nat'l Hoist Eng. Div.)

Hoists, Hand
Chain Belt Company
Harnischfeger Corp.

Hoists, Material Tower
Dravo Equipment Co.
Novo Engine Company

Hoppers, Concrete and Steel
(See Bins, Storage)

Horses, Steel Folding
Toledo Pressed Steel Co.

Inserts, Concrete
Truscon Steel Company

Instruments, Surveying
(See Transits and Levels)

Inspecting Laboratories
(See Directory of Engineers)

Inundators For Constant Concrete
(See Concrete Proportioning Equipment)

Joints, Expansion Paving
Truscon Steel Company

Joints, Filler Paving
Standard Oil Co. (Indiana)

Joints, Flexible Pipe
(See Pipe Joints)

Ladder Steps, Steel
Alan Wood Steel Co.
Blaw-Knox Company
Hendrick Mfg. Company

Lath, Expanded Metal
(See Expanded Metal)

Leadite
Leadite Co. Inc.

Lights, Contractors
Linde Air Products Co.
Novo Engine Company
Toledo Pressed Steel Co.

Loaders, Car & Wagon
Link-Belt Company

Loaders, Portable
Austin Mchy. Corp.
Barber-Greene Co.

Locomotives, Compressed Air
Porter Co., H. K.

Locomotives, Electric
Porter Company, H. K.
Whitcomb Locomotive Co.

Locomotives, Gasoline
Midwest Locomotive Wks.
Porter Company, H. K.
Whitcomb Locomotive Co.

Locomotives, Steam
Koppel Indust. Car & Equip. Co.
Porter Co., H. K.

Lumber
Brown Wood Preserving Co.

Maintainers, Road
Adams Company, J. D.

Manifolds, Oxygen
Linde Air Products Co.

Manometers
Simplex Valve & Meter Co

Meters, Boiler Feed Water
Builders Iron Fdy.

Meters, Gas and Steam
Builders Iron Fdy.
Wallace & Tiernan Co., Inc.

Metals, Perforated
Hendrick Mfg. Company

Meters, Water and Oil
Builders Iron Fdy.
Neptune Meter Co.
Simplex Valve & Meter Co.

Mixers, Concrete
Austin Mchy. Corp.
Cement Gun Co., Inc.
Chain Belt Company
Ransome Concrete Mchry. Co.

Mixers, Grout
Ransome Conc. Mchry. Co.

Mixers, Mortar
Chain Belt Company
Ransome Concrete Mchry. Co.

Mixers, Paving
Chain Belt Company
Ransome Concrete Mchry. Co.

Mixers, Truck
Blaw-Knox Company
Chain Belt Company

Mortar
Universal Atlas Cement Co.

Motors, Electric
Allis-Chalmers Mfg. Co.
Westinghouse Traction Brake Co.

Motors, Gasoline
(See Engines, Gasoline)

Motors, Portable
Haiss Mfg. Co., Geo.

Nails
American Steel & Wire Co.

Oxy-Acetylene Apparatus
Linde Air Products Co.

Oxygen
Linde Air Products Co.

Paint Cleaning Compound
De Vilbiss Company

Paint Spraying Equip.
De Vilbiss Company

Paints, Concrete & Masonry
Truscon Laboratories

Paints, Metal Protective
Truscon Laboratories

Paints, Waterproofing
Truscon Laboratories

Pavement Breakers
Schramm, Inc.

Paving Asphalt
(See Asphalt)

Paving Blocks, Wood
(See Creosoted Blocks
Timber, Poles, Cross Arms, Lumber, etc.)

Paving, Brick
(See Brick)

Paving, Cold Patching
Standard Oil Co. (Indiana)

Penstocks
Blaw-Knox Co.
Chicago Bridge & Iron Wks.
McClintic-Marshall Corp.
Pitts.-Des Moines Steel Co.
Taylor Forge & Pipe Wks.

Pile Drivers
Browning Crane & Shovel Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
McKiernan Terry Corp.
Vulcan Iron Wks. Chicago

Pile Extractors
McKiernan Terry Corp.
Vulcan Iron Wks. Chicago

Pile Hammers, Steam and Air
Industrial Brownhoist Corp.
McKiernan Terry Corp.
Vulcan Iron Wks., Chicago

Piles, Concrete
Raymond Concrete Pile Co
Spencer, White & Prentis, Inc.

Piles, Creosoted, Wood
American Creosoting Co.

Piling, Interlocking Steel
Carnegie Steel Company
Jones & Laughlin Steel Corp.
Spencer, White & Prentis, Inc.

Pipe, Bends
East Jersey Pipe Co.

Pipe, Cast Iron
Cast Iron Pipe Research Ass'n
Donaldson Iron Company
Fox & Co., John
Lynchburg Fdry. Co.
Republic Steel Corp.
Warren Fdry. & Pipe Corp.

Pipe, Cement-Lined
Cement Lined Pipe Co.

Pipe Coatings and Waterproofing
Wyckoff & Son Co., A.

Pipe, Concrete
McCracken Mchry. Co.

Pipe, Corrugated
(See Culverts)

Pipe, Drain
Gohi Culvert Mfrs., Inc.

Pipe, Dredge
Lancaster Iron Works
McClintic-Marshall Corp.

Pipe Fittings
Builders Iron Fdy.
Cast Iron Pipe Research Ass'n

Pipe, Forge and Hammer Welded
Taylor Forge & Pipe Wks.

Pipe, Joint Compounds and Materials
Leadite Co., Inc.

Pipe Joint, Flexible
Central Foundry Co.

Pipe, Lock Bar
East Jersey Pipe Co.

Pipe, Reinforced Concrete
Core Joint Concrete Pipe Co.

Pipe, Riveted Steel
Chicago Bridge & Iron Wks.
East Jersey Pipe Co.
McClintic-Marshall Corp.
Petroleum Iron Works Co.

Pipe, Sewer
Core Joint Concrete Pipe Co.
Gohi Culvert Mfrs., Inc.
Laclede Christy Clay Prod. Co.
McCracken Mchry. Co.

Pipe Shoes
Marion Malleable Ir. Wks.

Pipe, Steel, Welded and Wrought
Jones & Laughlin Steel Corp.

Pipe, Vitrified Clay
McCracken Mchy. Co.

Pipe, Wood
Redwood Mfg. Co.
Wyckoff & Son Co., A.

Poles, Steel, Structural
Carnegie Steel Company
Illinois Steel Company
Jones & Laughlin Steel Corp.

Poles, Steel, Sturctural
Blaw-Knox Co.

Power Units, Gasoline
(See Engines)

Pressed Steel Products
Blaw-Knox Co.
Truscon Steel Company

Pulverizers
(See Crushers)

Pumps, Boiler-Feed, Steam
Buffalo Steam Pump Co.
Frederick Iron & Steel Co.
Kingsford Fdry & Machine Works
Sullivan Machinery Co.

Pumps, Centrifugal and Multi-Stage High Lift
Allis-Chalmers Mfg. Co.
American Steam Pump Co.
American Well Works
Buffalo Steam Pump Co.
Chain Belt Company
De Laval Steam Turbine Co
Erie Pump & Engine Co.
Frederick Iron & Steel Co.
Kingsford Fdry & Machine Works
Lawrence Pump & Engine Co.
Layne & Bowler, Inc.
Lecourtenay Co.
Morris Machine Works
Nash Engrg. Co.

Pumps, Contractors
American Steam Pump Co.
Chain Belt Company
Domestic Engine & Pump Co.
Lawrence Pump & Engine Co.
Nash Engineering Co.

Pumps, Deep Well
American Well Works
Lecourtenay Co.
Novo Engine Company

Pumps, Dredging and Sand
Chain Belt Company
Domestic Engine & Pump Co.
Morris Machine Works
Norbom Engineering Co.
Novo Engine Company

Pumps, Power
Buffalo Steam Pump Co.
Domestic Engine & Pump Co.
Novo Engine Company

Pumps, Sewage
American Steam Pump Co.
Buffalo Steam Pump Co.
Kingsford Fdry & Machine Works
Lawrence Pump & Engine Co.
Nash Engineering Co.

Pumps, Underwriters' Centrifugal
Buffalo Steam Pump Co.

Rail and Rail Joints, Fastening and Specialties
Carnegie Steel Company

Rails, Relaying
(See Searchlight)

Railroad Ditchers
Bucyrus-Erie Company
Harnischfeger Corp.
Industrial Brownhoist Corp.

Refractories
Laclede Christy Clay Prod. Co.

Regulators, Compressed Gas
Linde Air Products Co.

Reinforcing, Bar Coupling
Marion Malleable Ir. Wks
Universal Form Clamp Co.

Reinforcing, Concrete
(See Concrete Reinforcement)

Reinforcing, Metal for Concrete Works
Ryerson & Son, Inc., Jos. T.
Truscon Steel Company

Road Finishers, Concrete
Austin Mchy. Corp.
Blaw-Knox Co.

Road Machinery
Adams Company, J. D.

Road Oils & Preservatives
Standard Oil Co. (Indiana)

Road Rollers, Gasoline and Steam
Austin-Western Rd. Mchry. Co.

Rolls, Crushing
Allis-Chalmers Mfg. Co.

Roof, Steel
Blaw-Knox Company
Ryerson & Son, Inc., Jos. T.
Truscon Steel Company

Roofing, Steel
Blaw-Knox Co.

Roofing Tile
Truscon Laboratories

Rope, Wire-Transmission, Hoisting and Haulage
American Steel & Wire Co.
Hazard Wire Rope Co.
Leschen & Sons Rope Co
Roebling's Sons Co., John

Sash Operating Apparatus
Lord & Burnham Co.

Sash, Steel, Window
(See Window Sash)

Saw Rigs, Portable
Chain Belt Company
Reed-Prentice Corp.

Scaffolding, Steel Adjustable
Toledo Pressed Steel Co.

Scoops, Wheeled
Riddell Company, W. A.

Scrapers, Scarifiers, Plows
Adams Company, J. D.
Austin-Western Rd. Mchry. Co.
Riddell Company, W. A.
Western Wheeled Scraper Co.

Screens, Sand, Gravel and Coal
Haiss Mfg. Co., Geo.
Hendrick Mfg. Company
Link-Belt Company

Second Hand Equipment
(See Searchlight Section)

Sewage Disposal Apparatus
Chain Belt Company
Link-Belt Company
McCracken Mchy. Co.
Metropolitan Paving Brick Co.
Nash Engineering Co.

Sewer, Pipe Joints Compound
(See Pipe Joints)

Sewer Segment Blocks
(See Pipe, Sewer)

Sheaves
Haiss Mfg. Co., Geo.

Sheets, Iron & Steel
Alan Wood Steel Co.
Ryerson & Son, Inc., Jos. T.

Sheets, Roofing & Siding
Ryerson & Son, Inc., Jos. T.

Shovel and Pile Driver Attachments
Browning Crane & Shovel Co.

Shoveling Machines
Myers-Whaley Co.

Shovels, Crawling Traction
Browning Crane & Shovel Co.
Buckeye Traction Ditcher Co.
Bucyrus-Erie Co.
Industrial Brownhoist Corp.
Ohio Power Shovel Co.

Shovels, Creeper
Industrial Brownhoist Corp.

Shovels, Diesel and Oil
Bucyrus-Erie Company
Harnischfeger Corp.
Industrial Brownhoist Corp.
Northwest Engineering Co.
Ohio Power Shovel Co.

Shovels, Gas and Electric
Buckeye Traction Ditcher Co.
Bucyrus-Erie Company
Harnischfeger Corp.
Industrial Brownhoist Corp.
Link-Belt Company
Northwest Engineering Co.
Ohio Power Shovel Co.
Universal Crane Co.

Shovels, Steam
(See Shovels, Crawling Traction)

Slag
Carnegie Steel Company

Snow Plows and Loaders
Austin-Western Rd. Mchry. Co.
Haiss Mfg. Co., Geo.
Riddell Company, W. A.

Spreader Ballast
Bucyrus-Erie Company

Sprinklers and Sweepers, Street
Austin Mchy. Corp.

Stamping, Sheet Metal
Toledo Pressed Steel Co.

Standpipes
Chicago Bridge & Ir. Wks.
McClintic-Marshall Corp.
Pitts-Des Moines Steel Co.

Steam Purifiers
Blaw-Knox Company

Steel
Alan Wood Steel Co.
Carnegie Steel Company
Illinois Steel Company
Inland Steel Company
Jones & Laughlin Steel Corp.
Republic Steel Corp.
Ryerson & Son, Inc., Jos. T.
Timken Roller Bearing Co., The

Steel, Copper Bearing
Alan Wood Steel Co.

Steel Plate Construction
Blaw-Knox Co.
Chicago Bridge & Ir. Wks.
Cole Mfg. Co., R. D.
East Jersey Pipe Co.
Inland Steel Company
McClintic-Marshall Corp.
Pitts.-Des Moines Steel Co.
Williams Co., G. H.

Steel, Structural
Belmont Iron Works
Blaw-Knox Co.
Carnegie Steel Company
Erie Steel Constr. Co.
Fort Pitt Bridge Works
Illinois Steel Company
Ingalls Iron Works
Inland Steel Company
Jones & Laughlin Steel Corp.
McClintic-Marshall Corp.
Mount Vernon Bridge Co.
Milwaukee Bridge Co.
Phoenix Bridge Co.
Pitts.-Des Moines Steel Co.
Ryerson & Son, Inc., Jos. T.
Shoemaker Bridge Co.
Snare Corp., Fred'k.
Virginia Bridge & Iron Co.
Wis. Bridge & Iron Works

Steel, Tool
Illinois Steel Company
Ryerson & Son, Inc., Jos. T.
Timken Roller Bearing Co., The

Stirups, Continuous Reinforcing Units
Ryerson & Son, Inc., Jos. T.

Structural Shapes, Steel
(See Steel, Structural)

Subgraders
Austin Mchry. Corp.
Blaw-Knox Co.

Tables & Board, Drawing
Dietzgen Co., Eugene
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Pitts.-Des Moines Steel Co.

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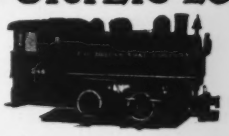

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ENGINEERING SERVICE DIRECTORY **101-104**

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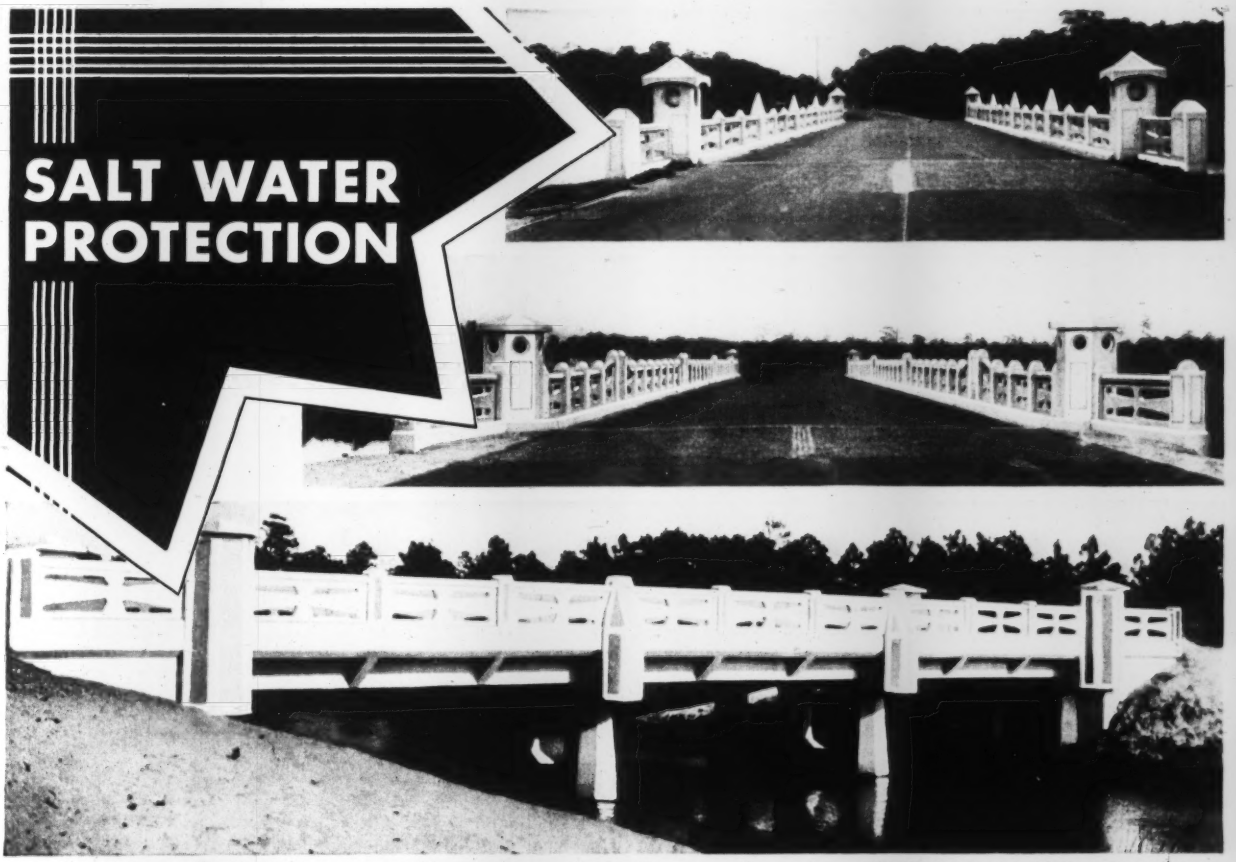

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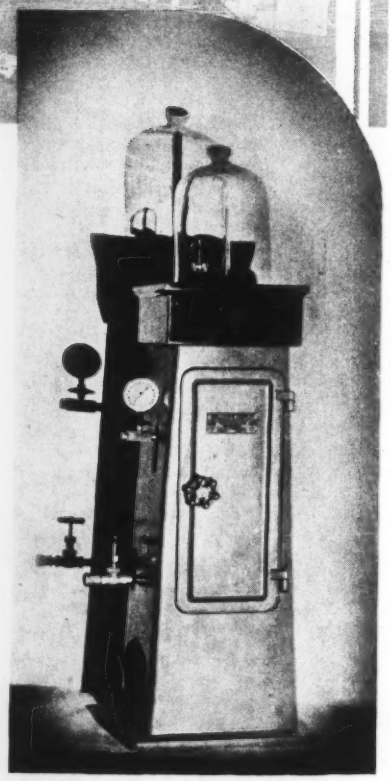

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